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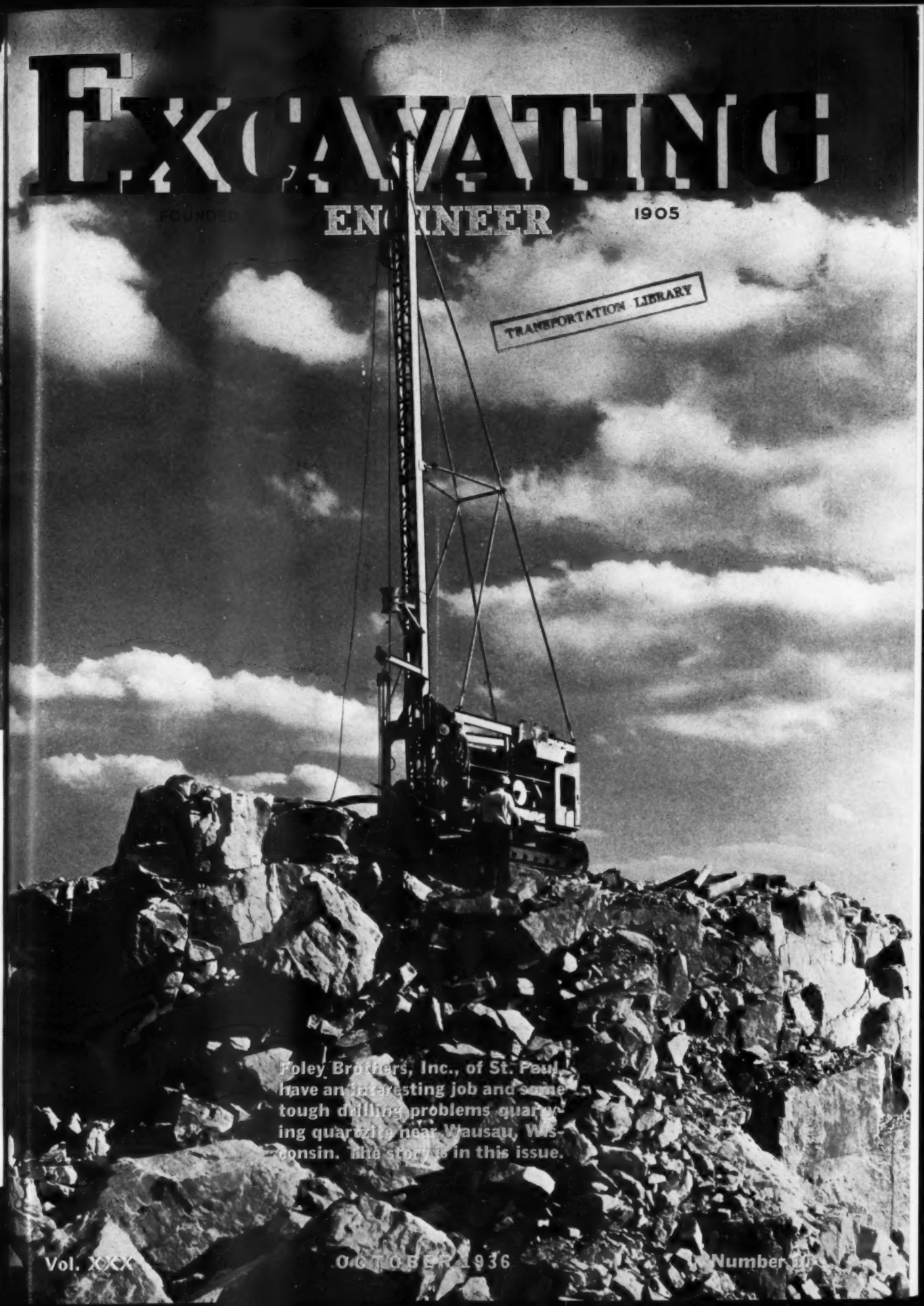
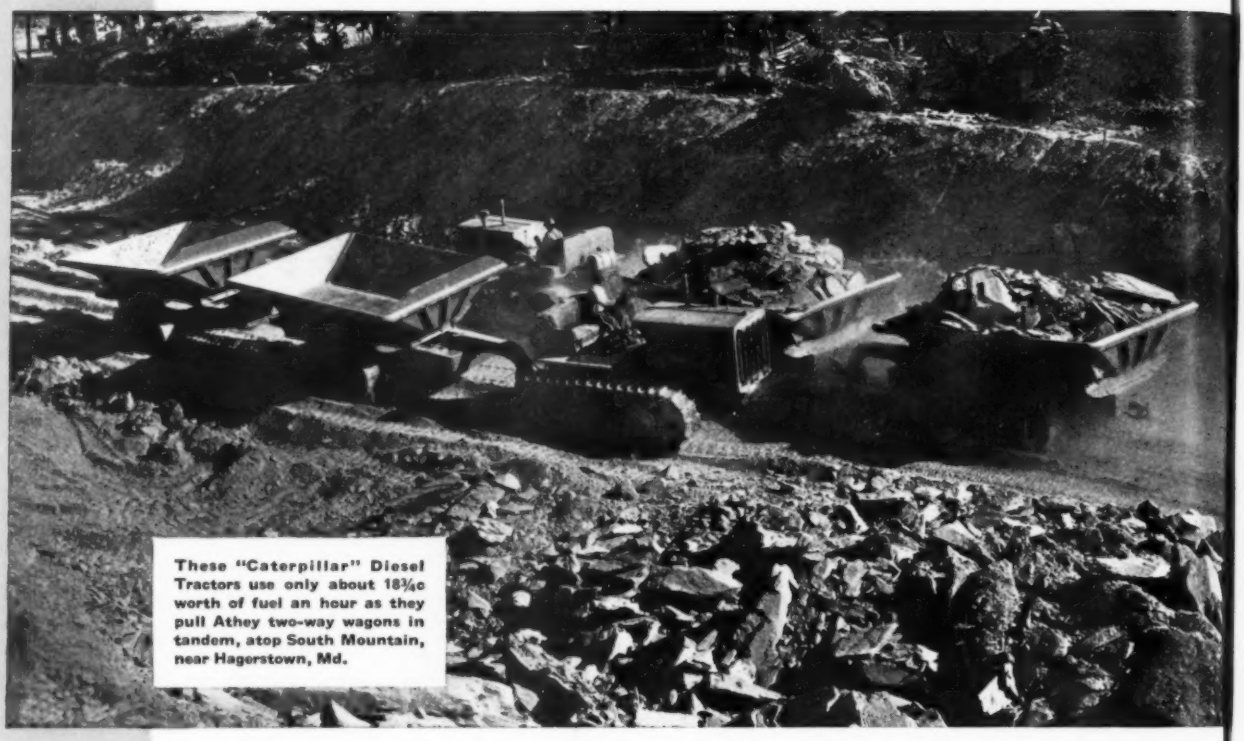


Foley Brothers, Inc., of St. Paul have an interesting job and some tough drilling problems quarrying quartzite near Wausau, Wisconsin. The story is in this issue.

Vol. XXX OCTOBER 1936 Number 10

FIRST
—IN EVERYTHING



These "Caterpillar" Diesel Tractors use only about 18¾c worth of fuel an hour as they pull Athey two-way wagons in tandem, atop South Mountain, near Hagerstown, Md.

For bulldozing, hauling, scraping—for everything—"Caterpillar" Diesel is "the world's FIRST tractor" in road construction and maintenance. The SHOW-DOWN shows why, because it shows that "Caterpillar" is first in power and first in performance . . . first in low operating cost (cuts fuel expense 60 to 80%) . . . first in stamina and low up-keep . . . first in long life. You'll cut costs, speed work, improve bids with "Caterpillar." The last word in tractors—it's FIRST! Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

THE SHOW-DOWN SHOWS THIS:

Report from a Massachusetts highway job: "Our 'Caterpillar' Diesel Tractor hauls two 12-yard wagons on a 1200-ft. haul from borrow pit to fill. The average round trip is completed in 12½ minutes, over a 20% grade for part of the trip."

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EXCAVATING ENGINEER

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DEVOTED EXCLUSIVELY TO EXCAVATION

About Excavating Projects — By Excavating Men — For Excavating Men — The World Over

Vol. 30 OCTOBER, 1936 No. 10

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These interesting articles will appear in early issues of Excavating Engineer. Watch for them!

Flexible Stone Plant

Elmhurst-Chicago Stone Company find 3-yard electric shovel reduces loading problems in modern quarry. Their plant is ingeniously adaptable to furnishing any desired combination of sizes of crushed stone.

Business is Booming

Introducing William Z. Williams, super shovel-salesman who falls into more trouble than you will believe possible. It is always darkest before the dawn, however, and Mr. Williams—but see for yourself how this ingenious young man turns defeat to victory.

Dredging a Hundred Million Yards

The second of the Fort Peck articles tells the story of the four dredges which are almost daily setting new records and pumping over 3,000,000 yards a month into the dam.

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F. O. WYSE
Managing Editor

ARNOLD ANDREWS
Editor

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D. B. REED, JR.
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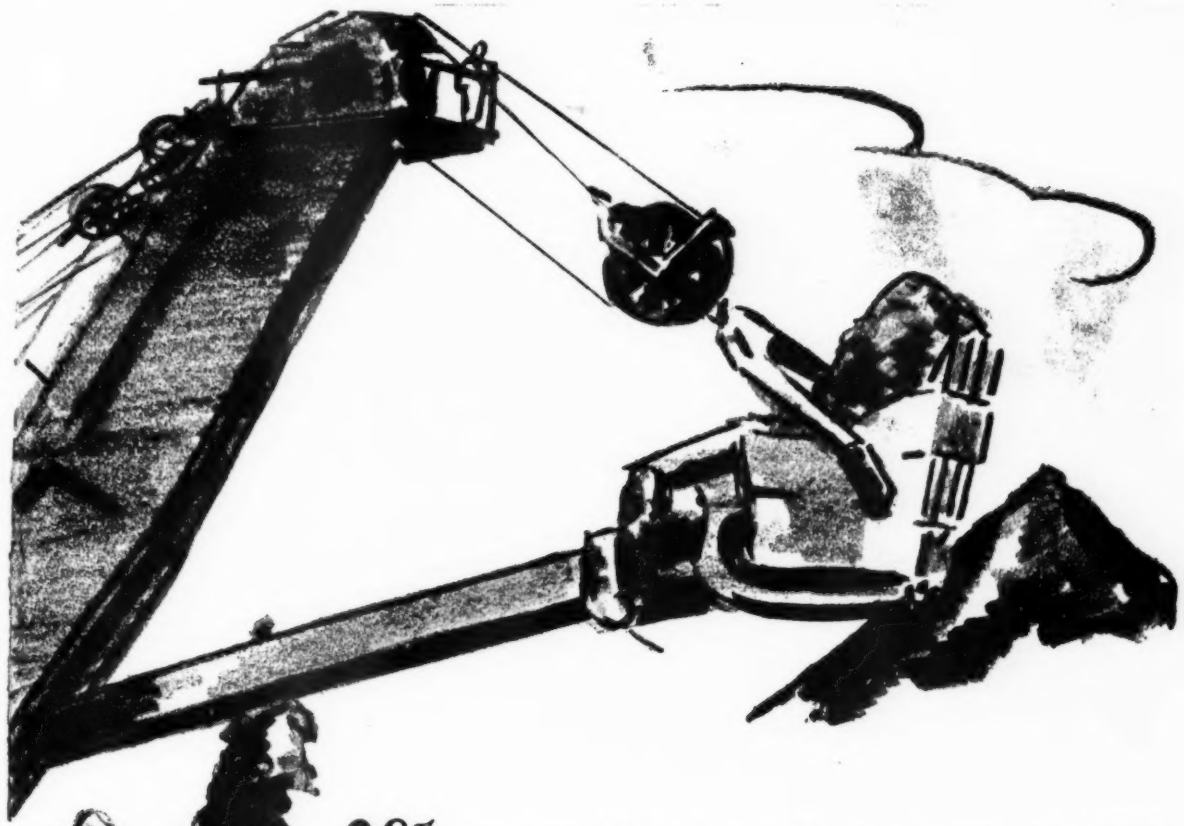

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Our high-tensile specialists will be glad to consult with you, are ready to give you competent, reliable advice on the use of these new steels. From their wide experience they can often suggest new ideas, new designs from other fields.

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SAN FRANCISCO - OAKLAND BAY BRIDGE

Photo shows west anchor under construction by Healy-Tibbitts Construction Co.

The letter is Healy-Tibbitts' own story of Gatke Brake Block performance on this mammoth job.

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One Third More Hauls per 8 Hour Shift

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ESTABLISHED 1898
GENERAL CONTRACTORS
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SAN FRANCISCO, CAL.

Gatke Corporation,
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Chicago, Illinois.

Attn: Mr. T. L. Gatke

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We thought you would be interested in getting this information.

Very truly yours,
HEALY-TIBBITTS CONSTRUCTION CO.
by E. A. Turkington
Vice-President

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KOEHRING

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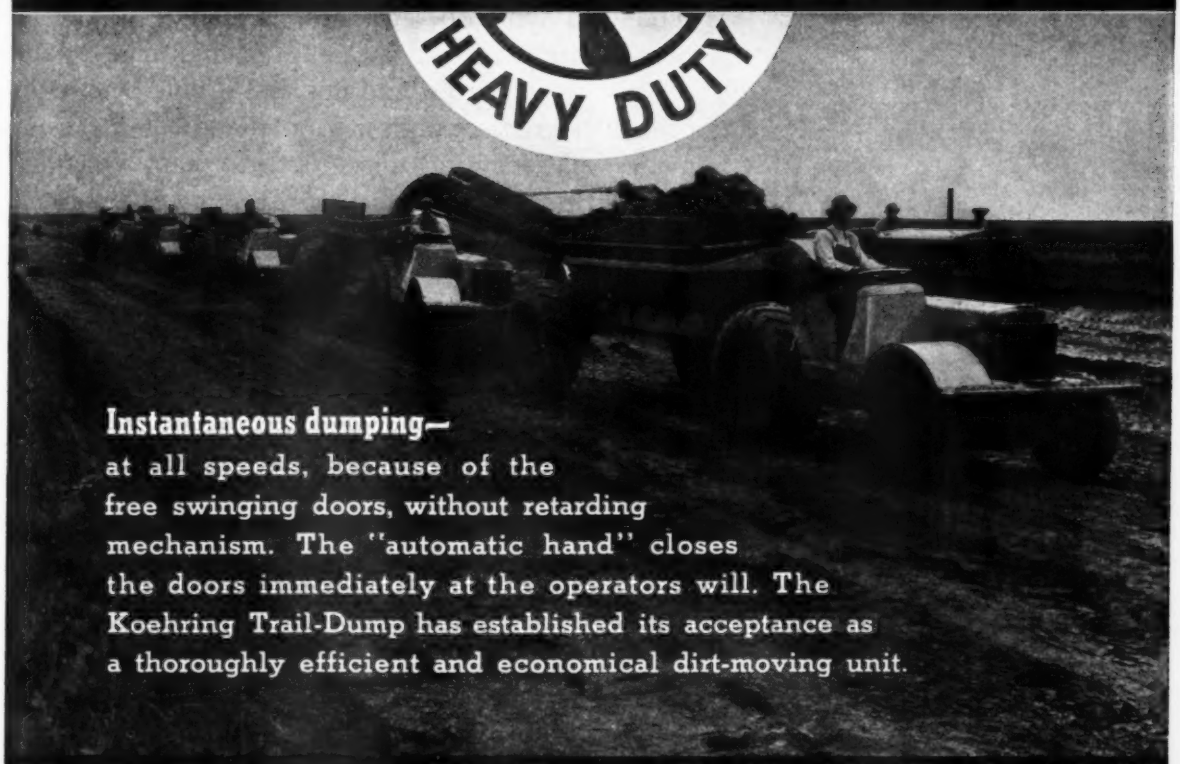
TRAIL DUMP

HEAVY DUTY



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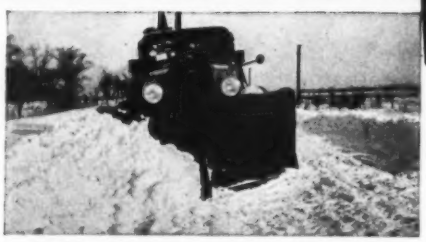

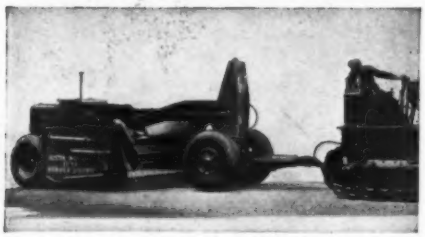

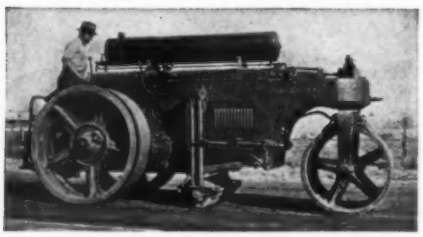

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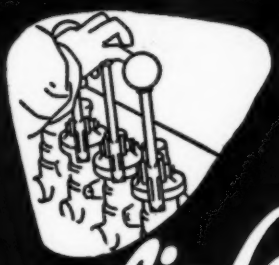

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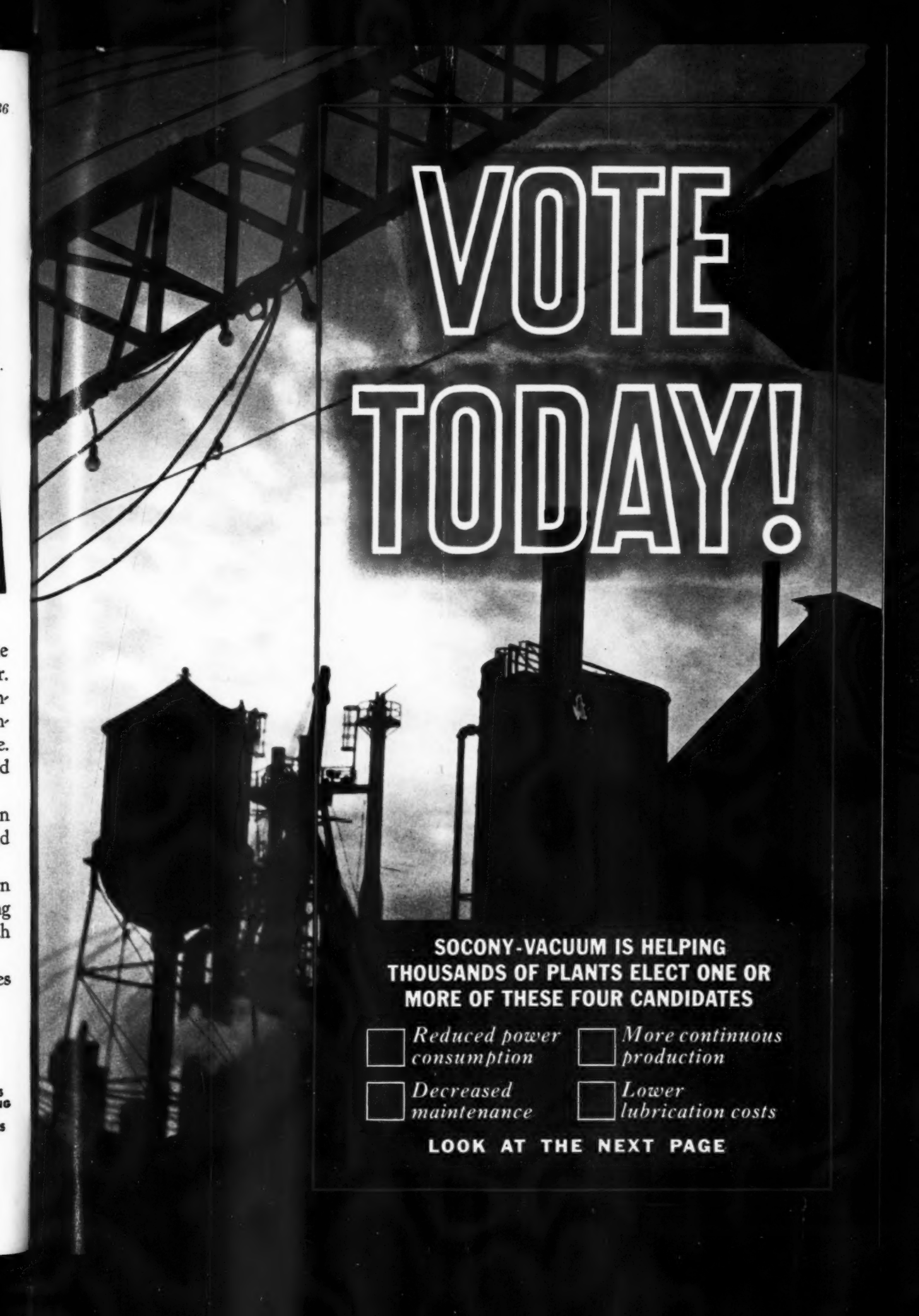
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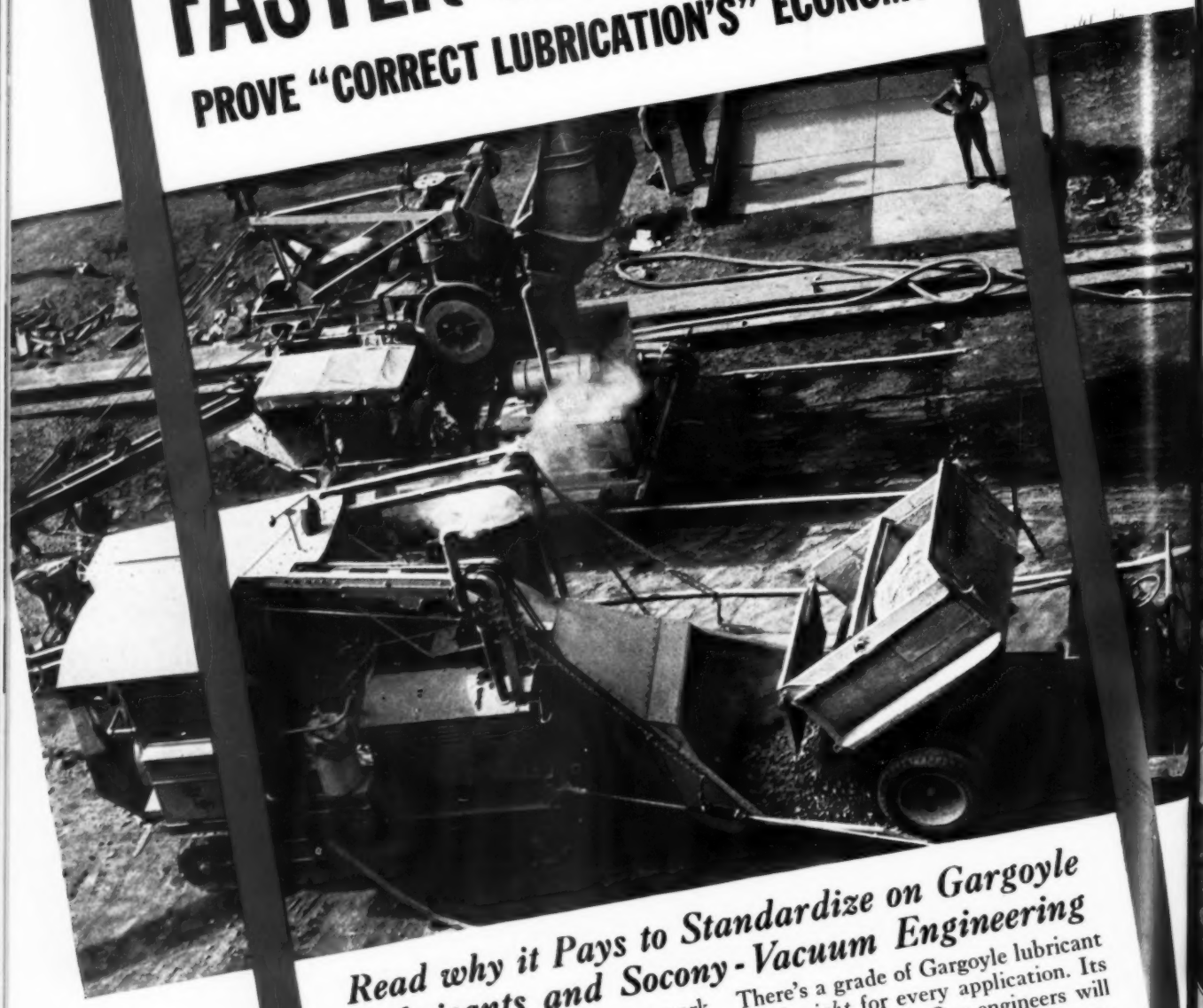

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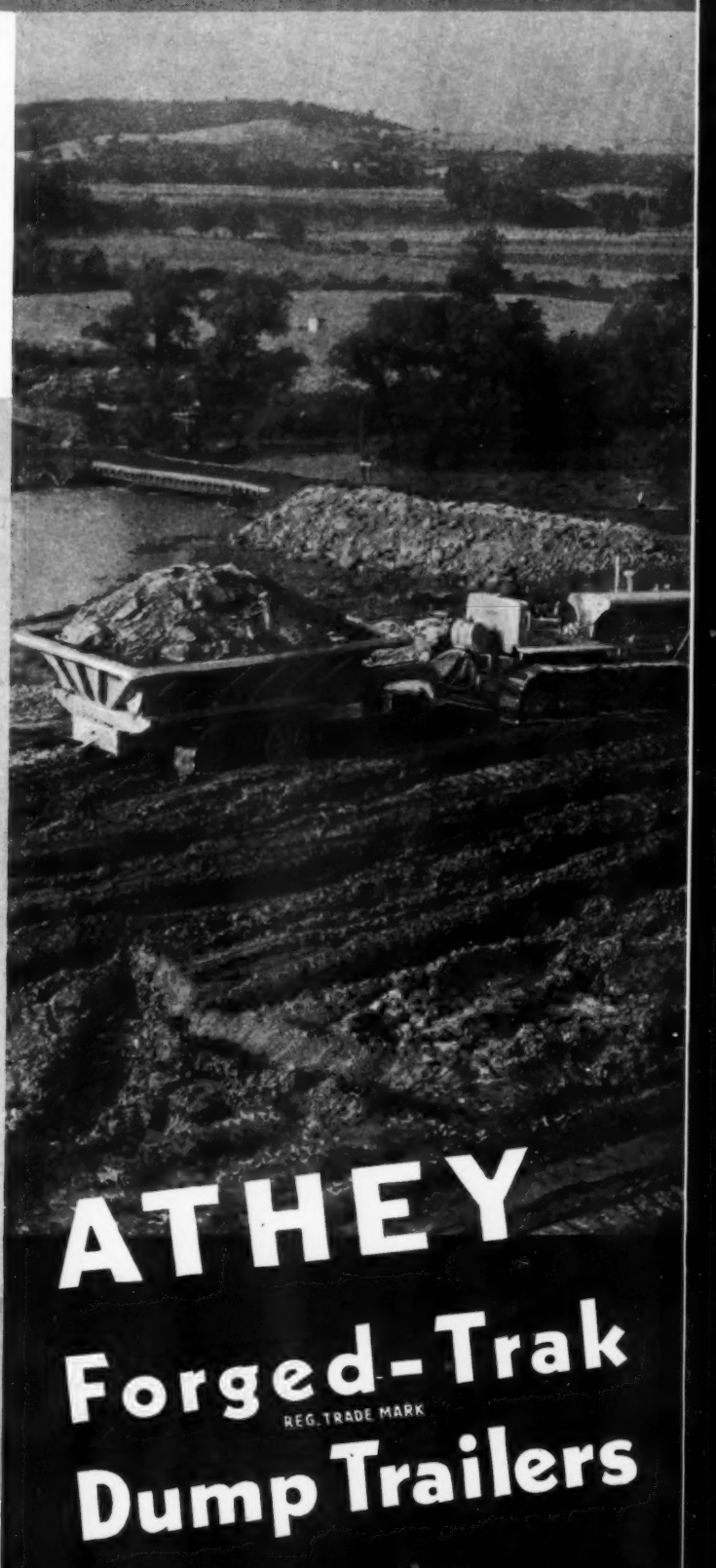

ATHEY Forged-Trak REG. TRADE MARK Dump Trailers

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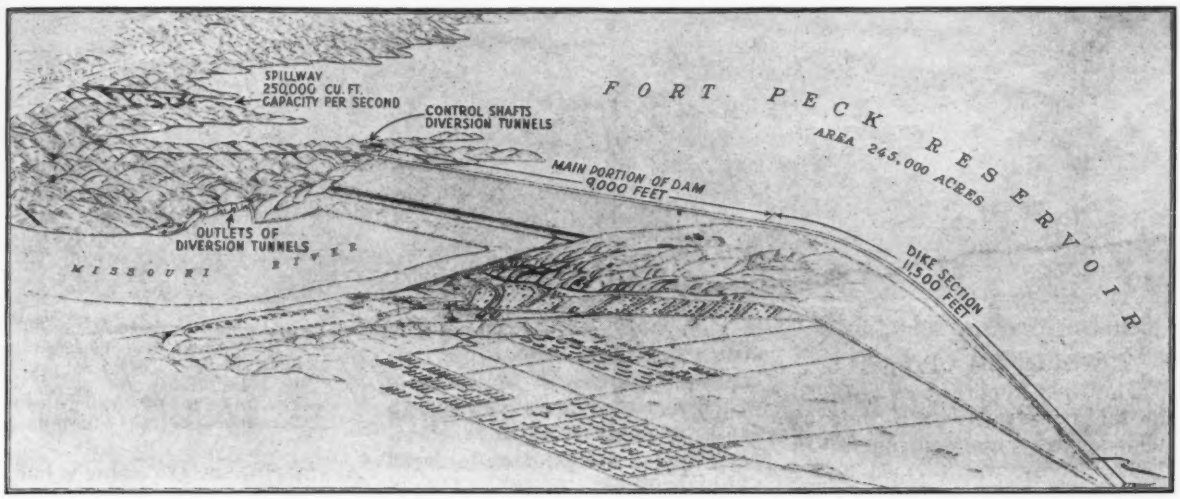
OCTOBER, 1936 VOLUME XXX NO. 10



• *This is an artist's drawing of the project as it will appear on completion.*

Fort Peck Dam

A general picture of the building by U. S. Army Engineers of the world's largest earth fill dam.

WORK at Fort Peck was begun October 23, 1933, with the speed of crack army troops moving into action, and has been continued at a comparable pace in the three years since that beginning. Speed was a prime requisite because of the necessity for creating immediate employment.

Fortunately, plans for the project did not have to be started from scratch. Possible river development on the upper Missouri, particularly at Fort Peck, had been investigated by the Army Engineers under the 1927 Congressional authorization which resulted in the "308 Reports." For a complete understanding of the Fort Peck project, some knowledge of that investigation is necessary.

• *The main dam at Fort Peck is shown on the opposite page as it looked with nearly 40,000,000 cubic yards of fill in place. The view is from the east bank, looking sections. Tunnel control shafts are west over main dam and dike in left foreground, with a section of the town of Fort Peck showing in right background.*

The Missouri is formed at Three Forks, Montana, by the junction of the Gallatin, Jefferson, and Madison rivers. Its 2470-mile course may be divided into three sections. Running north and east through Montana, the river flows through an arid, mountainous region, and is the scene of nine hydro-electric power developments. Entering North Dakota, the course turns southeast, and maintains this direction until the river joins the Mississippi about 15 miles north of St. Louis. In its central section, the Missouri flows between sloping hills, without much vegetation, where the climate is classified as arid. The lower section, from Yankton, South Dakota, to the mouth, consists principally of rolling plains. This is the section where the heaviest rainfall is experienced, and the only section of the three subject to much flood damage.

Discharge at the mouth varies considerably, ranging from a maximum of 900,000 second-foot to a 12,500 second-foot minimum, with a mean of 96,300.

Other features of the river which should be kept in mind are that for most of its lower course it is wide and shallow, heavily loaded with silt, and tends to have an unstable channel. With Yankton as the most northernly point to which a consistently navigable channel of any depth can be maintained, Sioux City, Omaha, St. Joseph, and the two Kansas Cities and their trade territories stand to benefit by a usable waterway connecting them with each other and the territory served by the Mississippi.

The foregoing data was kept in mind as possibilities for dams and reservoirs were studied. The Fort Peck site was selected as having the best characteristics, and possibilities for navigation, flood control, irrigation, and water power were thoroughly investi-

● *Main dam area as it looked from the east bank in 1935. Toes, cut-off wall and east core pool can be seen. Today, the cut-off wall and railroad trestles are buried far down in the hydraulic fill.*

gated by the Army Engineers.

Need for PWA Projects

The "308 Report" was released in tentative form at a time of wide-spread unemployment in 1932. P.W.A. was formed under the new Administration in 1933, and there was an immediate canvas for large meritorious projects which it could sponsor. The result was that construction of the dam was authorized and Fort Peck became P.W.A. Project No. 30 in October, 1933. A first allotment of $25,000,000 was made, and 500 men were put to work within two weeks. Employment steadily increased until the roll numbered over 7,000 in September, 1934. The figure dropped to 4,000 during the winter 1934-35, mounted again to 6,000, and has been maintained at from 5,000 to 10,000 ever since.

Definite decision to construct Fort Peck having been arrived at, it was necessary to make extensive sub-surface tests to supplement what had been undertaken in the "308" investigation. The latter had established that the bedrock was Bear Paw shale which was adequate to support an earth fill dam, and also that ample alluvial material suitable to the hydraulic method of construction was readily available.

Testing the Site

In the thorough testing preceding actual construction, over 87,000 feet of test holes were put down along the axis of the main dam, the adjacent dike section, upstream and downstream borrow pits, and various proposed spillway locations. Samples were taken every 5 feet in depth or whenever there was indication of a change in soil type, and great care was taken to insure accuracy. Samples were carefully laboratory-tested and soil maps and soil profiles drawn up.

This testing indicated a Bear Paw shale bedrock interspersed with layers of Bentonite clay to an estimated depth of 1,000 feet. This shale is a dense, heavy rock of marine origin which has a dark gray appearance when freshly uncovered. It is relatively impervious, and test holes showed no indication of major fault zones which would be likely to result in serious seepage under the dam. Because of its high moisture content (about 16 per cent) the shale weathers at an extremely rapid rate, crumbling into small flake-like fragments as soon as it is uncovered and exposed to the dry air of the region. This characteristic presented one of the chief construction problems in the diversion tunnels and at the spillway. Various methods used to combat this rapid weathering will be described later.

At the west abutment, a layer of glacial till rests on the shale, ranging to a depth of from 125 to 170 feet. The surface layer of

the flood plain, where the main section of the dam is located, was a gumbo which had to be stripped. Below this was a layer of fine sand including sublayers of gravel and clay, chiefly in the form of lenses.

Preventing Seepage by Cut-off Wall

It was feared that there might be appreciable seepage in the gravel strata; consequently, it was decided that a sheet steel cut-off wall should be driven to the shale foundation. At the east abutment, where the tunnels are located, surface material was 30 feet of weathered and disintegrated shale. To avoid seepage here, it was determined to extend the cut-off wall from the flood plain up the abutment to the crest.

The Bear Paw shale along the line of dike construction on the bench land west of the main dam is overlaid by a 125 to 175-foot layer of glacial till, upon which it was possible to build the dike hydraulically without fear of seepage, making it unnecessary to extent the cut-off wall the whole length of the dike.

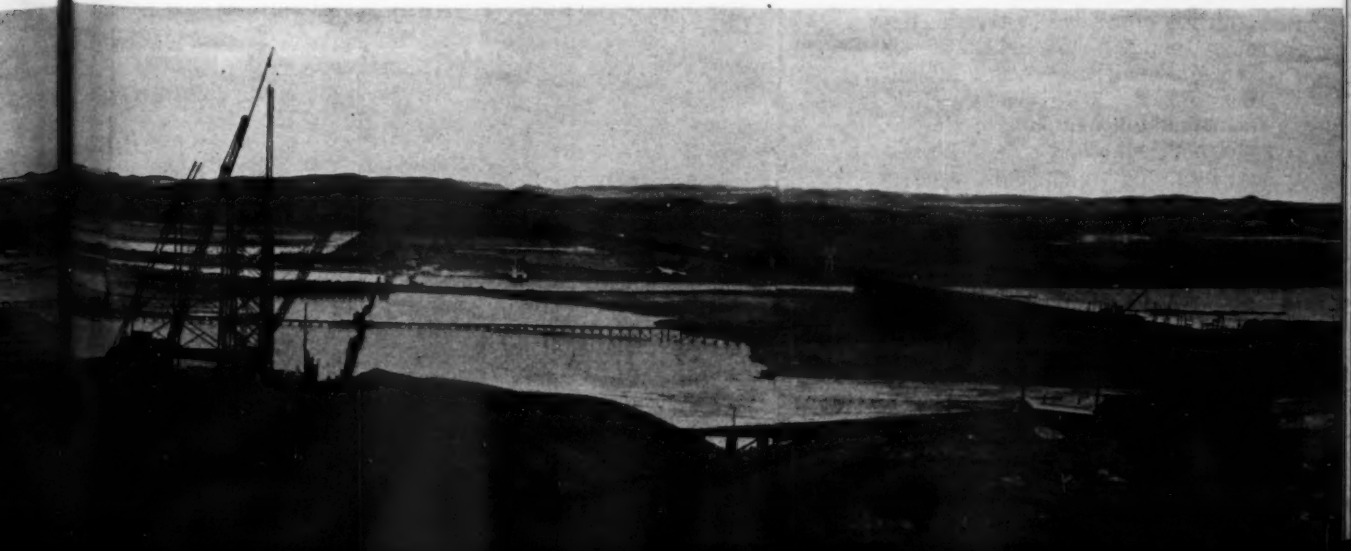
Tests of the borrow pits areas were carried five feet below the deepest level proposed for dredging. Accurate soil maps and profiles were made, showing the exact location of different classes of material. Use of these maps enables the dredges to be so placed as to pump any desired mixture of material.

Soil testing did not stop when actual construction work was begun. Daily soil reports on all fill moved are made out so that a close check can be kept on the material going into the dam, and the optimum combination of material be maintained.

Early Construction Needs

With Fort Peck located relatively far from power sources and industrial centers, the problem of throwing the work into high gear immediately following authorization of the project offered considerable difficulties. Work was to be handled partly by Government and partly by contract. Letting the contracts took time, but the Army Engineers went ahead with such of the work as could be started immediately. Within two weeks a force of 500 men were clearing the main dam site. Headquarters during this work was Glasgow, Montana, the nearest town, located about 20 miles northwest of the dam. The only route between the two was a dirt road which required considerable work to keep open until the State of Montana replaced it with a hard-surfaced highway. Accommodations in Glasgow were limited, and the job of housing the increasing influx of workers was a difficult

● *The main dam as it looked from the west bank in the summer of 1935. In the center are draglines and tower used for putting down the sheet steel cut-off wall. In the dam area itself can be seen draglines throwing up dikes, and one of the four dredges.*



● *A good notion of the speedy and "ant-like" industry with which operations on the spillway were carried on can be obtained from this air view. Compare it with the recent photograph on the opposite page.*

one until the construction camps and the town of Fort Peck were built.

An early need was a construction railroad running from Wiota, a station 20 miles east of Glasgow on the Great Northern, 12 miles to the dam site. Building this road was undertaken by Government forces in December, 1933, and scheduled to be completed in June, 1934. Actually, work was so speeded up that the branch line was officially opened on April 16, 1934, and had carried many carloads of material in to the dam before that date. This, despite an unsually cold winter, combined with an unexpected thaw in January. A bridge was needed for the 12 miles located across the Milk River and was built by contract by the Minneapolis Bridge Company. In addition to the 12 mile line to the switching yards below the dam, over 30 miles of additional trackage have since been built, about 7 miles of which is on bridge or trestle construction. A 3-mile bridge across the Missouri River was built under contract with the Massman Construction Company of Kansas City, Missouri.

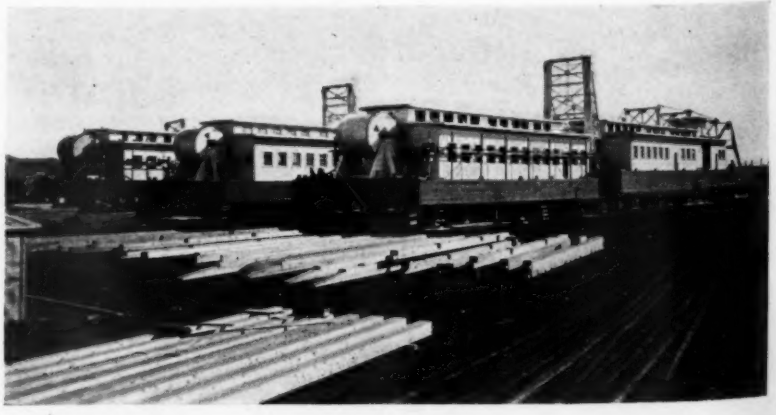
Obtaining sufficient electric power for operating the dredges and other equipment and for use in the town of Fort Peck was another of the first jobs to be tackled. It was decided that the required 62,000 h.p. could best be obtained by building a 288-mile transmission line connecting with the Montana Power Company's Rainbow plant near Great Falls. Contract for the line was awarded to the Ziebarth & Walker Company of Los Angeles. Substations were constructed at each end of the line, one by the Allis-Chalmers Manufacturing Company, and the other by the Westinghouse Electric & Manufacturing Company. Current carried by the line is 154,000-volt, 3-phase, 60-cycle, and is stepped down for use at dam and town.

Building a City On the Site

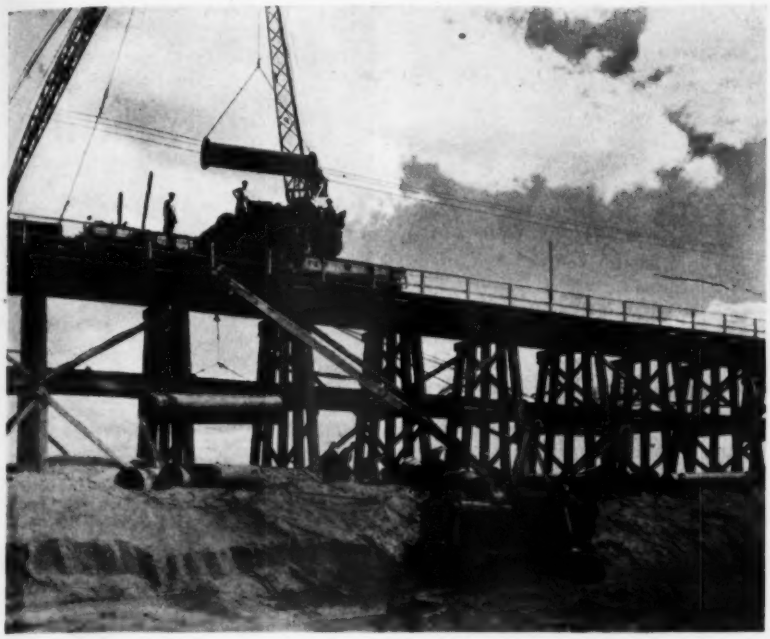
Like housing facilities at other large Government projects, the Town of Fort Peck is far more than an ordinary construction camp. Located on the west bank of the Missouri, a short distance north of the downstream toe of the dam, Fort Peck presents most of the aspects of a permanent town. Actually, construction was completed in seven months, and only the administration building and the twelve houses, now the quarters of the Army Engineer officers and civilian executives will remain after completion of the dam.

At present, nine blocks, each containing 16 bunkhouses, are quarters for the workers. For each block there is a mess hall and two separate bathhouses, containing a total of 36 showers for which there is always an abundance of hot water. Foremen are quartered in three blocks of dormitories, eight to a block, 15 rooms to a dormitory. Separate mess halls and garages also serve these quarters. Married administrative and supervisory executives are provided for in nine blocks of houses, 22 of which are duplex.

Although these buildings are temporary, they are constructed to secure comfort at all seasons for the occupants—a necessary feature, since temperatures range from 110 above to 60 below. Houses are of frame construction, double outer walls being sealed with insulating material. Double entrance doors, double floors, and insulating-board-lined interiors complete the protective characteristics of the construction. Furnaces in all buildings burn natural gas obtained from a



● *Operating a ship-yard in the ranch lands of Montana was just part of the work at Fort Peck. Here are three dredges under construction with their attendent boosters. The fourth dredge was rushed to completion ahead of the others to excavate a winter harbor.*



● *Setting up pipeline to handle dredge discharge, and moving the line as required, was a considerable job. Working down on the fill site, this Bucyrus-Erie Loadmaster helped speed up the handling.*

near-by county. Electricity is provided from the main line from Great Falls. Water is taken from the Missouri two miles above the dam and pumped to a treating plant and reservoir on high ground west of the town.

Public buildings found in ordinary towns are not lacking at Fort Peck. They include garage, stores, a restaurant, motion picture theater, grade school, hospital, and laundry. A modern cold storage plant and warehouse service Government and contractors' mess halls. Drab, monotonous appearance has been avoided by painting buildings, landscaping grounds, varying architecture, and laying streets out on curves. Altogether, the Town of Fort Peck presents a bustling, comfortable picture of a modern metropolitan suburb dropped on the high bank of the Missouri among the rolling ranch lands of northern Montana.

Even following the completion of facilities at Fort Peck, Glasgow continued to be the scene of much activity and headquarters for much of the floating labor, salesmen, tourists, etc. The housing picture would not be complete without some mention of the mushroom villages which have sprung up in the region adjacent to the Government-owned land, as has happened in the case of other large projects. Since these towns are not under Government supervision, the standard of living is not on a par with that in Fort Peck.

Aside from the general work already discussed, operations at Fort Peck fall into five major divisions: Stripping overburden at the main damsite; dredging, for main dam and dike; constructing the four diversion tunnels; building the spillway; and furnishing aggregate for concreting operations. These divisions will be taken up in detail in succeeding articles, but some description of them is necessary to the general introductory picture attempted here.

Dam Data

The main dam, much the largest of its type in the world, is an earthfill structure being constructed with four 28-inch dredges. When complete, it will contain 100,000,000 yards of earth, 4,000,000 yards of gravel and 1,600,000 yards of rock. The latter two materials are to be used at the toes and for riprapping the upstream face. The main section, running the width of the river bottom, will be 9,000 feet long, 242 feet high, and a maximum of 2,875 feet from toe to toe. It will be supplemented by a dike section, also hydraulically constructed, 11,500 feet long, running west from the main dam.

The reservoir behind the dam will have a capacity of 19,412,000 acre feet, will be 180 miles long and 16 miles in maximum width. Shore line will be 1,600 miles, and surface area 245,000 acres. Water sufficient to maintain a minimum flow of 30,000 second-feet at Yankton will be released from the reservoir through the control tunnels as needed.

These four tunnels are being driven through the shale on the east side of the dam. Average length is 6,160 feet, and they

(Continued on page 546)

● *A natural coulee has been shaped to make the spillway. Over 13,000,000 yards of dirt have been moved here by three contractors. Behind the Stoney Gates is the area where concrete is now being poured. Addison-Miller mixing plant can be seen in the center of the photograph.*

Traveling for the TVA

Mobility of ⅜-yard shovel speeds clean-up work all through Clinch River Valley

BUILDING Norris Dam in the Tennessee Valley entailed many construction problems besides the actual excavation for the structure, manufacture of aggregates, and mixing and placing of concrete. Much has been told, and told well, of these major operations and the new methods developed by T. V. A. engineers to meet the problems involved. But in the telling, interesting sidelights have been overlooked. The basin not being flooded was cleared; villages and farmhouses had to be removed; a large number of cemeteries transferred to higher locations; hundreds of miles of highways had to be abandoned and replaced; auxiliary small dams built for sanitary and beautification purposes. Each of these jobs had to be done with dispatch, and each presented a new situation to be met.

Fortunately, only a few miles of the highest type paved roads are innundated. Relocation of these was planned early in the program, and was handled by local contractors under the supervision of F. W. Webster, former Tennessee highway commissioner, now in charge of all T. V. A. road construction. A much bigger job, however, was the construction of secondary and tertiary roads to service farms and villages moved from flooded areas to new locations.

Because little time was available for locating the scores of miles of these roads, and still less time for the actual construction of them, the job was turned over to an organization of construction men supervised by R. H. Foss of the Construction and Maintenance Division, which built Norris Village, as well as all construction camps, shops, and approach roads throughout the valley. Unusually heavy rainfall in the Spring months made speed in this highway work even more necessary than had been expected, as the water in Norris lake rose 120 feet in the two months after the sluice gates were closed. Consequently, highway work was begun on the double.

● *Relocating "Sugar Hollow" road, the 10-B worked in a rock cut. The boulders in the foreground were all handled by this machine.*

The T. V. A. Directors, recognizing the necessity for expediting this work, gave Mr. Foss authority to select the men and equipment best fitted for the jobs. Among the well-trained men selected for performance of the various duties were: Lee V. Ragsdale, former Equipment Engineer of Tennessee State Highway Department, to requisition and supervise placing of equipment; Ed. D. Jeffries, former Highway Engineer of Knox County, Tennessee, to select new road locations; F. H. Hobbs, former State Maintenance Supervisor, to have charge of all work in Grainger and parts of Claiborne and Anderson Counties on the northern sector of the Norris basin; and, Ed. M. Tate, a graduate Engineer and former contractor of wide experience, to supervise the vast amount of grading, drainage, and surfacing in the wide area

● *In the background of this general view of the site of Caryville Dam, the town of Caryville may be seen at the foot of the mountains. The water in the foreground is a small neck of the lake.*

on the southern section of which Campbell County is the center.

Each of the men mentioned has had the full cooperation of other Departments of T. V. A. but owing to lack of time for the long-range planning, each of them was on his own resources much of the time. The early completion of the various projects speaks well for all concerned.

Owing to recent upturn in the Construction Industry in general, the T. V. A. has lost the services of Mr. Foss. He has returned to the firm of Morton C. Tuttle, from whom he was borrowed, and is now in charge of building a new paper mill at Charleston, S. C. He has been succeeded by Thos. D. Lebby, who formerly was with T. V. A. in charge of highway and railway relocation work in Wheeler Dam basin in Northern Alabama. Mr. Lebby has an enviable reputation as a road and bridge builder and will carry on the work of the C. & M. Division with the combination of technical skill and practical performance already established.

The necessary work was scattered over a wide area, and the equipment used had to be both fast and mobile. Some notion of the way the problem was met can be gained from a brief survey of the activity of a Bucyrus-Erie 10-B which was placed in operation about May 1, 1935. This ⅜-yard shovel was started widening and raising a road in Campbell County, near LaFollette. A few days later there was a job in excavating for a new laboratory building in the vicinity of the model town of Norris. The 10-B was loaded on its trailer, made the 40-mile trip in a hurry, finished up the job, and was moved to a new location for more road excavation. This schedule has been repeated weekly for more than a year, with the odd jobs rarely being the same. Except for holidays practically every day—rain or shine—has seen the 10-B hard at work somewhere in the T. V. A. Norris area.

● *The foundation for Caryville Dam, shown here, was excavated with TVA's speedy ⅜-yard shovel.*

● *Dressing up the new road in Claiborne County, another of the varied jobs done by this shovel. The road was formerly a rough, narrow trail through the mountains, "navigable" only on a half sled.*

● *Ed. M. Tate, highway construction superintendent No. 1 for TVA. His has been a tough job well-handled.*

According to Jess L. Bishop, foreman in charge of the 10-B, only four minor shut-downs due to breakage or necessary adjustments were experienced during the entire first year's service of the shovel. And this despite the fact that the machine was often worked in rock cuts without drilling or shooting because lack of time did not permit moving compressors in on the job. Much of the credit for the remarkable record is due to A. L. Long, who has operated the shovel almost from the beginning of its work.

Additional jobs handled by the 10-B included excavating for culverts, bridge piers, loading crushed stone from stock piles, and loading rock at the quarry for hauling to the crushers. Because of the speed with which the machine was moved from job to job, few detailed statistics were kept as to output for the various types of work performed.

A few interesting examples of actual work performed by the 10-B, taken from a diary kept by Supt. Ed Tate, are, as follows:

(*Continued on page 548*)

Multi-seamed formation presents drilling and blasting problems which Foley Brothers meet with 9-inch hole

ON August 13, 1934, Foley Brothers, Inc., of St. Paul, were awarded a three-year contract for furnishing quartzite to the Wausau, Wisconsin, plant of the Minnesota Mining and Manufacturing Company. The quartzite deposit is on the west shoulder of Rib Mountain, highest point in Wisconsin, and five and one half miles southwest of Wausau. This particular type of rock is not common, particularly in the ledge formation in which it is found here.

The quartzite is crushed and processed into tiny granules at the Wausau plant of the Minnesota Mining and Manufacturing Company. Some of the granules are sent to the Company's St. Paul plant where they are used in the manufacture of an excellent grade of sand and emery paper and other products.

Foley Brothers moved in an office—a converted railroad car—to the plant site; put C. M. Thor, who has been with them for 10 years, in charge of their part of the work; and work on the contract began promptly. Production at the quarry was governed by the capacity of the plant. Up to July 26, 1936, 390,000 tons had been delivered to the jaw crushers. With the limitation on quantity, the problem facing Foley Brothers became one of cutting costs without the aid of increasing production. A tough task—made tougher by the combination of such circumstances as seamed formation, plenty of oversize, and inclement winter weather. Plenty of ingenuity has gone into meeting the difficulties, as will be evident in the discussion of various phases of the work.

Overburden

The quartzite ledge at the quarry is of unknown depth, of extremely rough surface, and is covered by soft overburden ranging up to fifteen feet deep. A 1¼-yard Bucyrus-Erie Gas+Air shovel was used for stripping, clearing the entire surface planned for drilling and blasting. The part played by this machine in subsequent operations will be told later.

Drilling

Early blast hole drilling was handled by a wheel-mounted rig swinging 6-inch tools. Due to the roughness of the ground over which the machine had to move, this type of mounting proved un-

duly cumbersome. Because the quarry rock was criss-crossed with seams running in every direction, it proved impossible to spring the 6-inch holes because of the danger of losing them under falls of loose rock. As the face then being worked was about 55 feet high, with nearly a 1 to 1 slope, it was difficult to get sufficient explosives in the 6-inch holes to move the heavy toe. However, two blasts were shot under these handicaps.

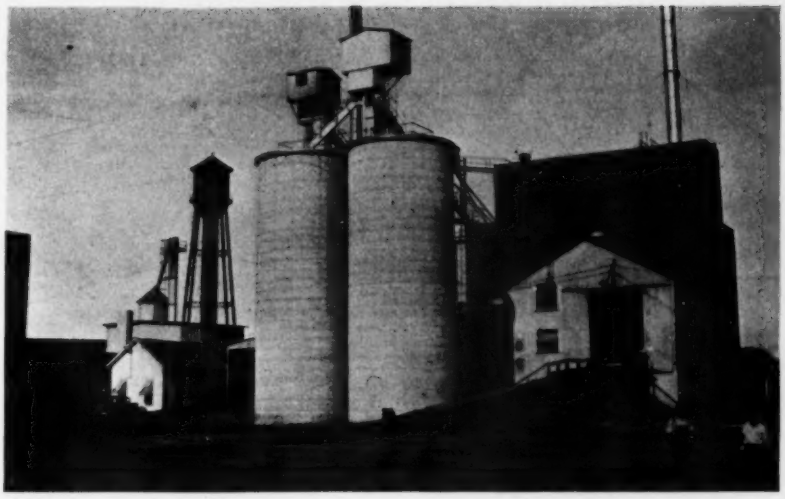
Nine-inch Drill Introduced

In April, 1935, a Bucyrus-Armstrong 29-T blast hole drill with caterpillar-type mounting was purchased and moved in to start work on Blast No. 3. Powered with a 40 h.p. Wisconsin gasoline engine and using 250 feet of ¾-inch Macwhyte left lay cable, this rig swings 2,800 pounds of 9-inch tools. With the machine, Bucyrus-Armstrong tools and a No. 12 Bucyrus-Armstrong bit dresser were bought.

Blast No. 3, for which drilling was started on April 17, was used to bring down a 100 foot face, since then the quarry has been worked in two 50-foot lifts. The 120,000 tons of rock brought down stands as the largest tonnage produced in this quarry by a single blast. Procedure and results are typical of succeeding shots and afford a good basis of comparison with the 6-inch technique. For these reasons, this blast will be discussed in detail.

Blast No. 3

Between April 17 and May 6, 12 9-inch holes, ranging in depth from 90 to 108 feet were put down six feet back from the edge of the face. Holes were spaced 22 feet apart along the western and central portion where the face was straight, and 15 to 20 feet at the eastern end which was curved.



• *Foley Brothers deliver quartzite to this plant of the Minnesota Mining & Manufacturing Company at Wausau, Wisconsin. The rock is here made into granules for use on sand and emery paper. A truck is unloading to the jaw crusher in the photograph. The gentlemen in the right foreground are not employees.*

Starter bits were used for the first 10 or 15 feet of each hole.

Drilling was handled in three 8-hour shifts, with a driller and helper working each. Total drilling time for the 12 holes was 710 hours, and total footage came to 1158½ feet. Average footage per hour was 1.61, with as high as 4 feet being obtained when conditions were favorable. Due to the seamed character of the quartzite, considerable difficulty was experienced in keeping the holes straight. At first straightening was attempted with cast iron and wood blocks, but without much success. It was found better to shoot the holes lightly with from one to four pounds of explosive. This scarred up the face of the hole and enabled the drill to straighten it out.

Bits were used from 50 to 55 minutes and then changed. This time was adopted as standard after carefully checked experimentation. It was found that longer use in this rock wore the bits so that dressing took too much time. Furthermore, hole drilled by a bit after 55 minutes of use was likely to cause trouble in getting a new bit started. Shorter time per bit proved unnecessary for drilling efficiency and, of course, appreciably increased the number of bits to be sharpened over a period of time.

Bit Dressing

A two-man crew, working one 10-hour shift on the bit dresser, easily handled the requirements of the three drill shifts. Of course, use of starter bits in beginning each hole gave the dressing crew a period in which to get ahead. Open seams and consequent deflection of the bit occasionally resulted in side wear which increased the time required for

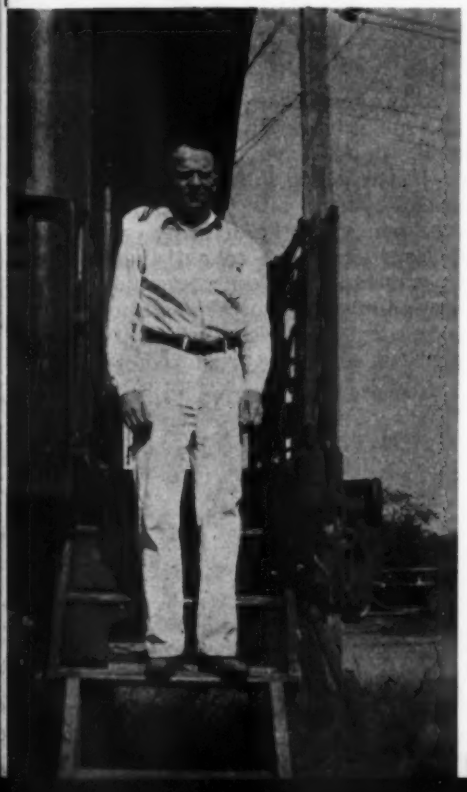
• *Move your eye fast enough from left to right, and you'll see a moving picture of the drill mast going up after the machine moved down from top of high face shown in the background and prior to starting a new set of 9-inch holes.*

● *Left: The "portable" office used by Foley Brothers at Wausau is near the crushing plant. The box car is used for a storeroom. Right: Weather hazards may make transporting rock from quarry to plant difficult. Consequently, this stock pile is maintained near the plant for emergency use.*

dressing. Despite this, however, average dressing time ran well under one hour per bit. One man with a truck handled necessary hauling of bits and water to the drill in about two hours a day.

Results secured with the bit dresser, on following work as well as that handled on Blast 3, have been very satisfactory, according to Superintendent Thor. Uniformity of sharpening has been an aid to rate of penetration. In a given time, more 9-inch bits can be sharpened than was possible when 6-inch bits were being dressed by hand, with a consequent saving in costs.

● *M. H. Thor, Foley Brothers superintendent, is shown on the steps of the railroad-car-office at Wausau. His ideas have helped cut costs on this difficult quarrying job.*



Moving

Moving and setting up on Blast No. 3 was a real job. The surface was as jagged as a model of the Rocky Mountains. The mast had to come down for most moves, and a great deal of blocking was required. Being new to the machine the men were not in a position to make full use of its remarkable stability. Under these conditions moving time per hole ranged from 1¼ to 3½ hours, the average being 2½. This figure represented a considerable reduction over that which had been necessary with the wheel-mounted rig, and was cut subsequently.

Reliever Holes

While the blast holes were being put down, a series of 20-foot reliever holes, spaced from 6 to 7 feet apart, was drilled with drifters and jackhammers. These holes were started at 2⅜ inches and taken down to 1½ inches in 13 stages. They were carried to about two feet below the level of the quarry floor, and sprung.

Loading Explosives

A total of 1500 pounds of Atlas L F Extra 60 per cent gelatin was loaded in the reliever holes. Atlas explosives were also used in the blast holes, total amount going into the 12 being 22,150 pounds. The distribution in the holes can be seen in the accompanying diagram which is an exact record of the loading in No. 7 hole. Eight of the 12 were loaded in the same way, the only variation being in the depth of stemming from surface to the two-foot layer containing 25 pounds of Apex No. 1. In the other three holes, the change in placement and amount of explosive was slight.

Blasting

The shot was detonated on May 15 with 925 feet of Cordeau-Bickford and 51 20-foot electric exploders, and brought down 120,000 tons of quartzite, 4.9 tons per pound of explosive. Actual results from No. 7 hole are shown in the second of the accompanying drawings. Back break for all the holes ranged from 30 to 83 feet. Fragmentation varied at different parts of its face, due to differences in seaming and the fact that the rock is hardest at the east end of the face. The 4.9 tons per pound of explosive does not include secondary blasting and seam shooting. Considerable of the latter was required to work back to a solid face for effective well drill operation.

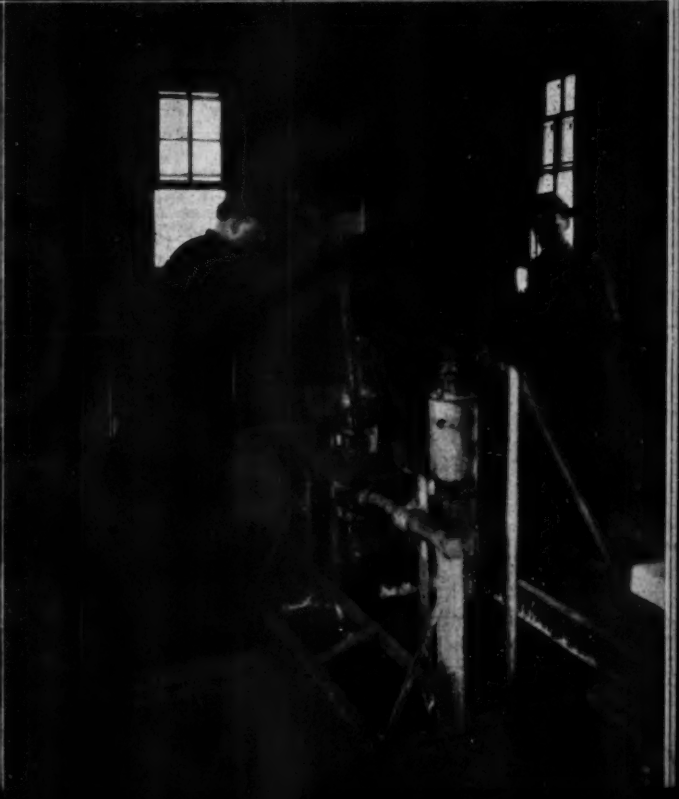
In Comparison

Comparing results obtained from 9-inch hole with those from 6-inch, Superintendent Thor said: "We cut our drilling time 31 per cent with the new rig. The reduction in moving time was one im-

(Continued on page 530)

● *The three photographs on the opposite page show the three steps in dressing a 9-inch Bucyrus-Armstrong bit: heating, dressing and quenching. One crew, working a 10-hour shift, keeps ahead of 3 drill crews. Bits are sharpened after 55 minutes of use in the seamed quartzite.*

BUCYR
ARMSTR



EXCAVATING ENGINEER

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The Business Situation

THE business advances made during the first half of 1936 have continued in the third quarter of the year. Commenting on this encouraging record, the Cleveland Trust Company summarizes the situation as follows:

"This is the first year since before the depression in which general business has improved for three consecutive quarters. The steady course of improvement of the second quarter over the first, and the third quarter above the second, has prevailed in all the major divisions of our economic life except one. There has been progressive improvement in manufacturing, mining, construction, trade, and transportation. The single major exception is agriculture, and there the effects of the drought have been so very severe that many crops will have seriously small yields.

"Perhaps a further exception should be made with respect to our foreign trade, but the figures which would enable us to be sure about that are not yet available. The steadiness with which progress has been made this year is more important than the amount of the advance. Until now the recovery that began in 1932 has been most irregular with encouraging advances being largely cancelled by disheartening reversals. This time the advances have been largely held, and they have become important almost throughout our whole economy instead of being largely confined to the automotive and related industries as was formerly the case.

"The political campaign seems to be having no important effect, either favorable or adverse, on the course of business activity. The same thing has been true so far of the unsettled and threatening conditions of affairs in Europe. Probably the most unfavorable factor in the near-term outlook is the advance in the prices of agricultural commodities due to the short crops. This is operating to increase the cost of living by raising the prices of food, and so decreasing the spending power of workers for other goods.

"Agricultural prices have moved up so far that the total incomes of the farmers this year will probably exceed those of last year, but they will be most unevely distributed. Corporation earnings as a whole have increased this year in even greater degree than the volumes of business have expanded. Probably there will be many irregular and unpredictable changes in dividend payments between now and the close of the year as managements and boards of directors and legal advisors and bankers reconcile their judgments as to the wise and prudent disposals to be made of corporate earnings.

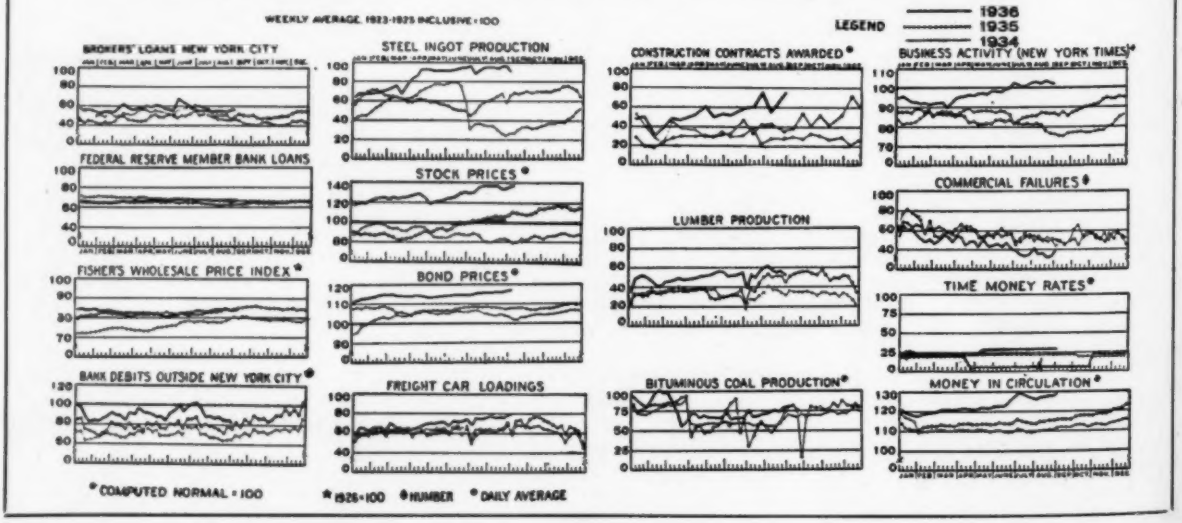
"Business activity has advanced so vigorously this summer that the business indexes for July released for publication at the end of August by the Federal Reserve Board make the remarkable record of showing a unanimous series of increases. No item in the list of 20 of them registers a decline. In manufacturing the important increases are not only in the durable goods, but in the consumption goods also. There has been no important summer slackening, and apparently the August figures will hold up well. Preliminary data of the index of industrial production of this bank show output 9.4 per cent below the computed normal level in June, 7.5 below in July, and 7.5 below in August."

Highway Safety

WE ARE coming more and more to realize just how dangerously antiquated our highways are in view of the developments in construction and use of today's high-speed automobile.

As stated in a recent article in Fortune, ". . . traffic today is a

WEEKLY BUSINESS INDICATORS



combination of an eighty-mile-an-hour car in the hands of a twenty-mile-an-hour driver struggling to adjust itself to a thirty-mile-an-hour road."

Fortune adds, with mild grimness, "And it doesn't work out very well."

In 1935 it worked out to the tune of 37,000 killed, 105,000 more permanently crippled and 1,000,000 others injured. The economic loss to us, as society, involved in those figures has been estimated at $1,600,000,000. The statistics are staggering, but they are too large, too cold, for their actual significance to you and to me to be readily grasped.

"And Sudden Death," published by The Readers' Digest, puts the situation in striking terms of human agony. Other articles and editorials, in increasing number, give indication that we are at last waking up to the butchery going on among us.

Granted the terrible actuality of the problem—97 per cent of our main highway system is composed of twenty-foot, two-lane paved road which was modern fifteen years ago—what is our remedy?

Is the solution in mechanically limiting the speed of our vehicles?

The answer must be that it is not. The automobile is, today, a necessary tool of life and making a living. Limiting its speed drastically enough to add appreciably to general safety would tremendously hamper its efficient use. In addition, a noted traffic control expert has said, "If it were possible to apply everything we know about traffic control, we could eliminate 98 per cent of all accidents."

Is the answer, then, in driver education?

Partly, beyond doubt. A. E. Neyhart, of Pennsylvania State College, has taught nearly 100 drivers—and not one of them has had an accident. More encouraging, because it reaches more people, is the growing tendency to include driving lessons in regular high school work. Even this, however, can at best reach only a fraction of the driving populace.

What about strict laws, stringently enforced?

The city of Evanston, Illinois, has shown what can be done in making an urban area safe in this way, by reducing its motor death rate from 42 per 100,000 to 2.9 per 100,000. But most of our worst accidents occur on the "open" highway. No state could support a police force sufficient for adequate traffic control.

"Believe Me This Is the Last Time I Register Twice on a Relief Roll!"

Courtesy Cappers Farmer

The final answer must be that, if we are to achieve safety, it has got to come through making our highways practically fool-proof. Taken in conjunction with the safety being incorporated in modern cars, the goal is not impossible to attain, although the cost involved seems tremendous compared with even that of the six-lane concrete roads which were thought for a time to be the solution to the safety problem.

All the necessary characteristics of the safe road of the future are known now. What traffic experts and Fortune call the "limited way" road eliminates accidents by removing the physical road factors which make them possible. This road is composed of two one-way, two-lane sections, separated by a center strip which is planted, or otherwise made impossible to drive on. Wide, clear shoulders reduce chances for striking telephone poles or other marginal objects and obviate necessity for "going in the ditch." Clover leaf intersections eliminate left turns, provide a third lane for slowing or accelerating when entering or leaving the road, and grade separations do away with railroad hazards.

Because these "limited way" roads need from 150 to 300-foot right of ways, they are costly. Expense varies, of course, with the value of the adjacent land. Expensive or not, however, this type of road must be built, is now being built in isolated instances. We are slowly realizing that our traffic toll cannot continue, and we have learned where the relief lies. As to cost—if we omit from consideration the important by-products of the new roads such as increased efficiency in automotive travel and stimulus to general business from necessary construction work, we still could afford to build nearly two billion dollars worth of "limited way" roads a year. This merely on the basis of spending for highways instead of for accidents.

Not only can we afford to plan and build modern highways—but we cannot afford **not** to build them. The necessity is terribly present; recognition of that necessity is ever increasing. Every American citizen should keep it constantly in mind, and work for those highways, and against gas tax diversion, unnecessary governmental projects—every plan or attempt to slow up modernization of our highways. In the face of accident statistics, the position that we are building too many highways is grotesquely untenable.

Immediate and effective steps must be taken to make our highways safe for modern use.

EQUIPMENT
You Ought to Know About

Bucyrus-Erie Announces New Blast-Hole Drill

"THE most modern, largest capacity, portable blast-hole drill on the market"—is how Bucyrus-Erie Company of South Milwaukee, Wisconsin, describe their newest and largest drill, the 42-T.

According to the manufacturers, this new drill has been built in answer to the growing demand for a blast-hole drill to put down large diameter (9" to 12") holes at a faster drilling rate than previously possible. Where the formation permits, larger diameter holes with wider spacing have been found to give much greater tonnage per foot of hole drilled, and provide reduced preparation costs. Even where the nature of the formation is such that smaller holes are necessary for good fragmentation, the 42-T produces more footage than any other portable drill.

The new drill swings up to 6,000 pounds of cable-tools, thus concentrating tremendous energy at the bottom of the hole. The exclusive Bucyrus-Armstrong rubber shock absorbers give exceptional drilling snap to the tools. Wide-spread, full-length crawler mountings make moves easily and quickly. All-steel, welded construction throughout gives the machine unusual strength, long life, low maintenance expense.

Besides the many features typical of the whole line of Bucyrus-Armstrong drills — rubber shock absorbers, rubber-insulated sheaves, welded, all-steel construction, wire line cable, convenience of controls, etc. — the 42-T has several features that are new to the blast-hole field. One of these new developments is a power-driven tool wrench that sets up and breaks tool joints entirely by power. Another new feature found on the 42-T is a method for raising the telescoping derrick by power from the engine.

A choice of Diesel engine or electric motor is offered on the 42-T. Ample power is provided with these power plants to meet all possible blast-hole drilling conditions.

The 42-T fills out the Bucyrus-Armstrong line of blast-hole drills —26-T, 29-T, and now the 42-T. Full information concerning the new big drill may be obtained by writing to Bucyrus-Erie Company.

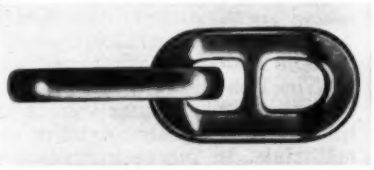
Truckair Compressor

A NEW compressor unit designed specifically for truck mounting with power take-off from the truck propellor shaft has been announced by the Sullivan Machinery Company, Michigan City, Indiana. The compressor is two stage air-cooled with capacity of 105 C.F.M. delivered—enough to operate a large rock drill or two pavement breakers.

Features stressed are force feed lubrication, anti-friction main bearings, automatic control and small space requirements so that major part of truck space can be utilized to carry men, tools and materials. Of special interest to gas companies is the special vacuum hood which also permits vacuum cleaning of service lines.

New Design of Drag Line Bucket Chain

CAST Manganese Steel drag-line bucket pulling and hoisting chains were first introduced by American Manganese Steel Company in 1928. They promptly proved their economy by giving several times the wearing life of ordinary chains with a resistance to breakage fully equal to chain usually employed.



The properties of austenitic manganese steel; namely, high tensile strength and ductility, combined with its recognized surface work-hardening capacity, together with excellent design of links, accounted for this performance. Since then, a large number of drag-line operators throughout the country, and several drag-line bucket manufacturers have proved to their own satisfaction that cast heat-treated manganese steel chain is definitely economical in the severest service.

American Manganese Steel Company now announces a new design of drag-line bucket chain, on which patent has been applied for.

The manufacturer claims ten distinctive design features:

1. Increased strength over previous Amsco chain.
2. Full line instead of point bearing between links.
3. Additional metal on sides of links getting abrasive wear.
4. Lighter weight than comparable cast chains.
5. Considerably lighter weight than previous Amsco chain.
6. Tie bar across link to prevent snarling and kinking.
7. Equalized metal sections insuring perfect heat-treatment in manufacture and consequent better physical properties.
8. Clean lines making for clean castings.
9. Distinctive design.
10. Made of heat-treated austenitic manganese steel which combines strength, toughness, and wear resistance.

5 REASONS *why* DUMP TRUCK OPERATORS SAVE MONEY WITH HIGH PROFILE GOODYEARS

1 Goodyear's All-Weather Tread is even broader, flatter—has deeper-cut diamond blocks that give better grip, pull, traction and non-skid protection.

2 Patented pre-shrunk Supertwist Cord, far more elastic than ordinary cords, gives body greater strength, reduces flexing heat, adds thousands of miles to tire life.

3 High Profile Tread Shape increases flexing zone, dissipates heat more readily, provides better cushioning—puts more rubber on ground.

4 Extra-strong Braided Wire Beads protect against swaying loads and overloads, insure firm seating of tire on rim.

5 Chemically Toughened Rubber in both tread and body resists both tread wear and heat—protects against blow-outs.

More miles of tire life—*thousands more*—mean but one thing to truck operators—LOWER TIRE COSTS!

But you get BOTH—and more, too—in the new High Profile Goodyear for trucks.

Bigger, sturdier, tougher—you'll find this tire better in every way on the job—better in traction, in cushioning, in driving.

And it's safer. It gives you protection against both skidding and blow-outs—against carcass failure of any kind—not equalled in any other tire.

Why this amazing *plus performance?*

Because only Goodyear—in this new High Profile Truck Tire—offers you the five money-saving, *plus construction features* opposite.

Read them. See the tire. SAVE MONEY!

THE GOODYEAR TIRE & RUBBER COMPANY, INC., AKRON, OHIO

Listen to the Goodyear Broadcasts of the Literary Digest Poll for President
Monday, Wednesday, Friday Evenings NBC Blue Network

THERE'S A GOODYEAR BATTERY *now!*

GOODYEAR
TRUCK TIRES *money savers*

For your convenience in writing to the Goodyear Tire & Rubber Company, Inc., you will find a card bound bound in this issue.

Not in the Contract

The Department of Taxation received a typed income tax return from a bachelor who listed one dependent son. The examiner returned the blank with a pencilled notation—"This must be a stenographic error." Presently the blank came back with the added pencil notation, "You're telling me!"

Lady (at party)—Where's that pretty maid who was passing out cocktails a while ago?

Hostess—Oh, are you looking for a drink?

Lady—No, I'm looking for my husband!

"Yeah, we're pretty tough in these parts, stranger. Hangin' on thet tree outside is Leatherneck Joe; we got sore at him last week and hung him."

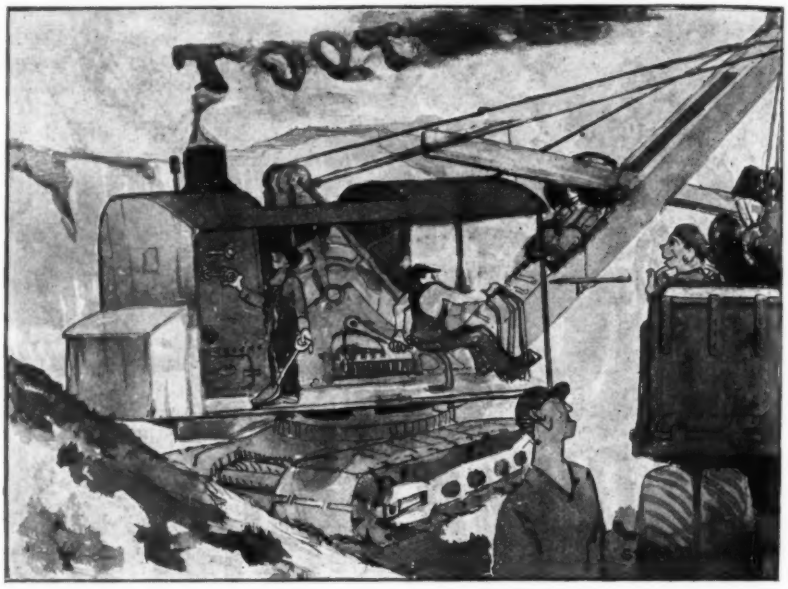
"Why don't you cut him down and bury him?"

"Bury him? Gosh, no! D'ya think we want to bury him alive?"

He—I suppose you dance.

She—Oh, yes, I love to.

He—Great! That's better than dancing.



Naw, he's not just playin'. They broke the whistle.

Do you object to kissing, Mehitabel?

That is something I've never done, Joshua.

Kissed, Mehitabel?

Objected, Joshua.

I guess old Joe's washed up. He used to pack 'em in.

She—So you're from the garage? Do you grease cars?

He—Only the cushions, lady, I'm the repair man.

Professor: "Can you give me an example of a commercial appliance used in ancient times?"

Student: "Yes sir, the loose-leaf system used in the Garden of Eden."

The dairy maid put on her coat
And went to milk the family goat.
She tried and tried,
And then she cried:
"Be still, Nanny, stand still!"
The poor goat sighed,
And then replied,
"This ain't Nanny, it's Bill."

When a girl's boy friend is lit up, he's full, but when her parlor is lit up, it's empty.

Potts was a great man! Three towns have been named after him: Pottsville, Pottstown and Chambersburg.

"Mr. Jones, dad wants to borrow your corkscrew."

"All right, sonny," said Jones, reaching for his coat. "You run along home—I'll bring it over."

95%

OF ALL FIRST ORDERS FOR TRU·LAY *Preformed*

REPEAT!

At least 95 per cent of all those who buy TRU-LAY Rope for the first time on our recommendations come back for more. What better acknowledgment could there be of TRU-LAY's all-around superiority?

The reasons for this high percentage of repeat business are many. In the first place TRU-LAY Preformed is easier to handle. It resists kinking, requires no seizing. It is faster to splice and socket. It resists twisting in sheave or drum grooves. Broken crown wires refuse to wicker out to jab workmen's hands. Being completely free of all internal stress *it lasts much longer.* It is a perfect example of relaxation based on preformation.

Specify TRU-LAY Preformed for your next rope. Learn, on your own equipment and with your own men, the real dollar value of this *original* preformed rope.

AMERICAN CABLE COMPANY, Inc.

Wilkes-Barre, Pennsylvania

An Associate Company of the American Chain Company, Inc.

IN BUSINESS FOR YOUR SAFETY

District Offices: Atlanta Chicago Detroit Denver New York Philadelphia Pittsburgh Houston San Francisco

TRU·LAY *Preformed* Wire Rope

ALL AMERICAN CABLE COMPANY ROPES MADE OF IMPROVED PLOW STEEL ARE IDENTIFIED BY THE EMERALD STRAND

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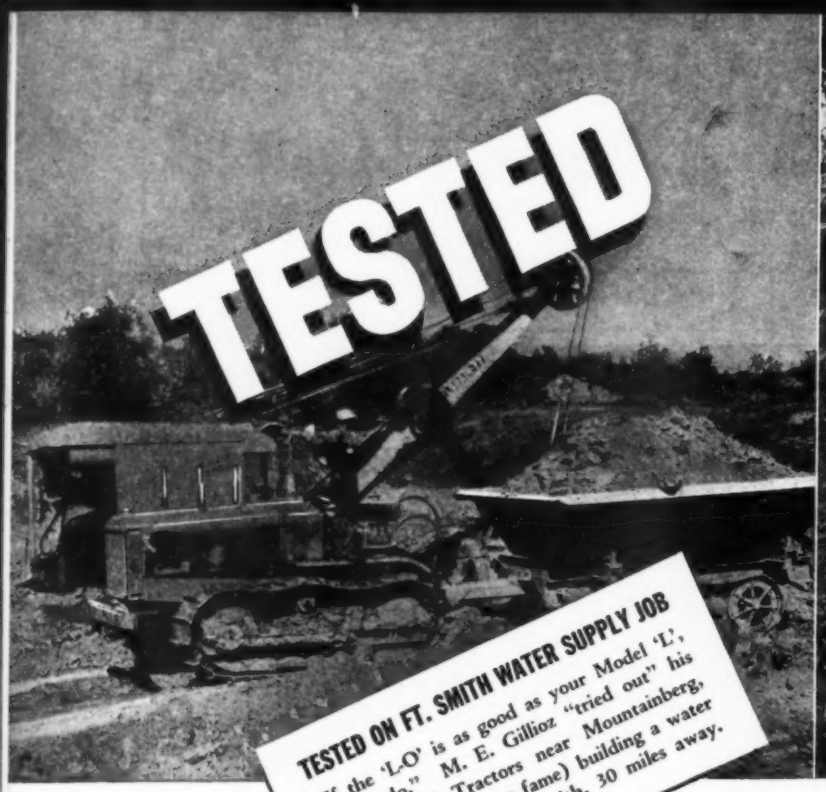
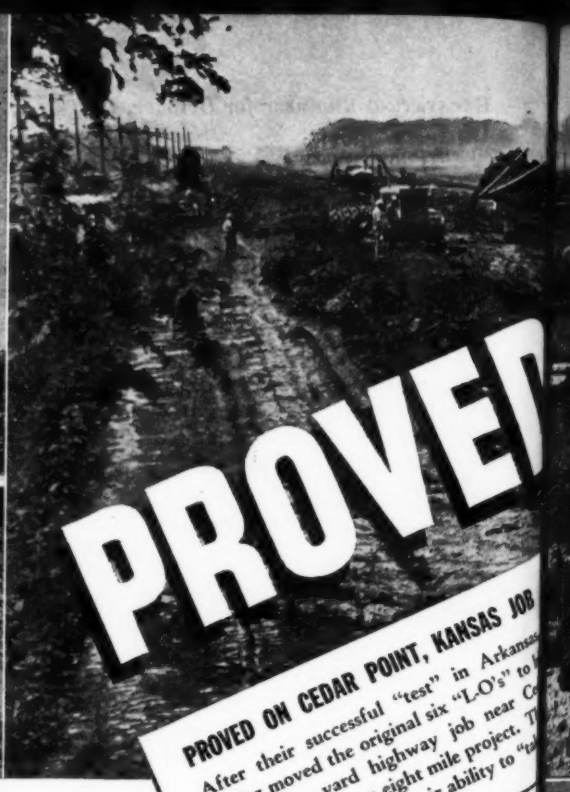


TESTED ON FT. SMITH WATER SUPPLY JOB

"If the 'L-O' is as good as your Model 'L', it will do." M. E. Gillioz "tried out" his first six Oil Tractors near Mountainberg, Ark., (of Bob Burns fame) building a water supply dam for Fort Smith, 30 miles away.



PROVED ON CEDAR POINT, KANSAS JOB

After their successful "test" in Arkansas, Gillioz moved the original six "L-O's" to a half-million yard highway job near Cedar Point, Kansas—an eight mile project. There they further proved their ability to "take

FIRST .. 6 OIL TRACTORS ... THEN *8 more* FOR GILLIOZ

IN THE VERY HEART of the great Skyline Highway job . . . M. E. Gillioz of Monett, Mo., is carving 17 miles of scenic highway out of steep, rocky mountainsides. A big contract . . . involving 1,000,000 cubic yards . . . but all in the day's work to Gillioz. For dependable performance that would assure getting the work done on schedule . . . this successful contractor selected Allis-Chalmers Controlled Ignition Oil Tractors. Besides Diesel fuel oil economy, A-C Oil Tractors have such advantages as smoothness, balance and instant starting, made possible by controlled spark ignition. No wonder Oil Tractor owners repeat!

ALLIS-CHALMERS
TRACTOR DIVISION—MILWAUKEE, U. S. A.

Controlled Ignition O'R

APPROVED!
8 MORE ORDERED FOR THE SKYLINE JOB
Awarded 17 miles of the famous Skyline Highway in Virginia's Blue Ridge Mountains, Gillioz relied on the tractor that had proved itself on previous jobs — ordered eight more Model "L-O" Oil Tractors. Shown here are "L-O's" with bulldozer and 12-yard A-C wagons, working on the million yard contract.
O TRACTORS

Quarrying Quartzite

(Continued from page 520)

portant factor. Another is that standard spacing was 15 feet with the 6-inch hole. When we increased it to 22 with the 9-inch, we naturally cut down on the number of holes, without reducing the rate of penetration.

"We used about the same proportion of explosives to rock in each size, but found it much easier to place them efficiently in the 9-inch hole. This better placement is an important advantage in moving such a heavy toe."

While drilling problems of the job were greatly simplified by the new machine and the experience gained on Blast 3, other difficulties had to be solved independently. Due to the nature of the formation, so much oversize is encountered that handling it by secondary blasting would be ruinously expensive. Still, the jaw crushers down at the Wausau plant were only 36 x 48, dimensions which could not increase no matter what happened to quarrying costs.

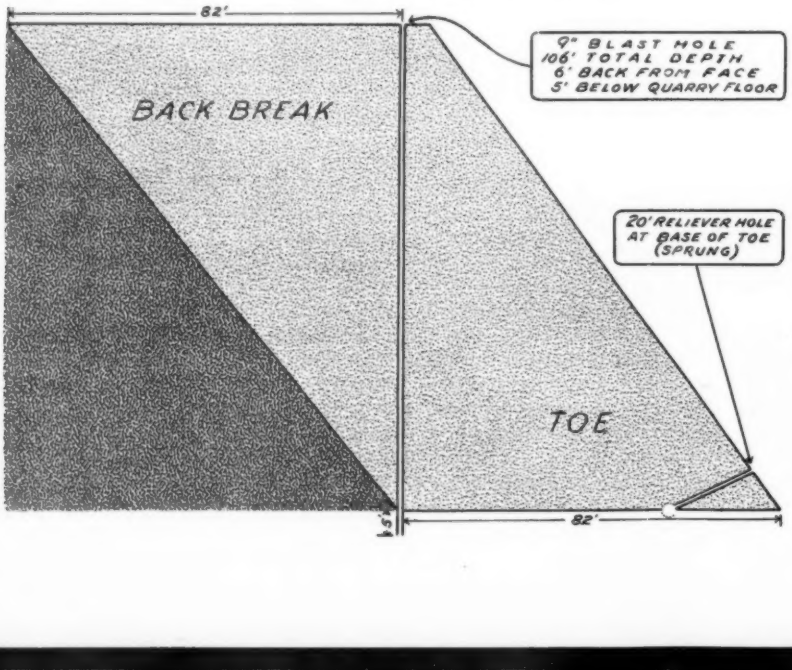
An effective answer to the dilemma was found in an ingenious use of the Bucyrus-Erie Gas+Air which had been used for stripping overburden. The front end shovel equipment was replaced by a 40-foot dragline boom. Operating as a crane, the machine was then used to drop a 5,000-pound "skull-cracker" on the oversize. Very satisfactory breakage is obtained, and the loading shovel is not required to shut down or move as it would if the oversize were handled by explosives. Although secondary blasting has not been entirely eliminated, it has been kept down to a minimum that doesn't floor the cost sheet.

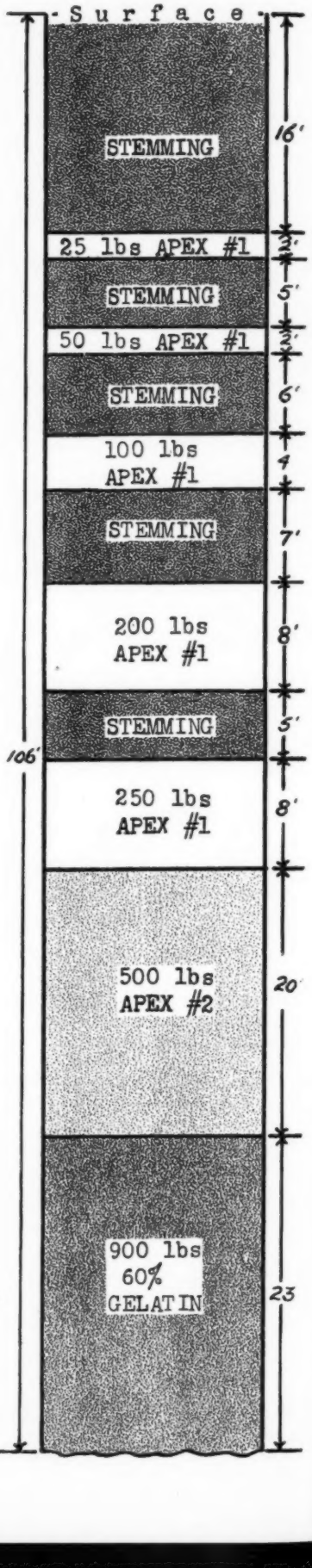
Rock Loading

Rock is loaded with a Fairbanks-Morse Diesel-powered 1¾ yard P&H. The 1¼-yard rock dipper used on the shovel acts as a grizzly. Any rock which will pass through it can be handled by the jaw crushers. The shovel operates three shifts, loading 50 to 75 tons per hour, or from 1000 to 1500 tons per three shifts, with the exact amount governed by the plant capacity.

Hauling

Six semi-trailer units are used for the 5½-mile haul from quarry to plant. Three of these are 2½-ton, 351-B Diamond T tractors and Stoughton semi-trailers. Average load with these trucks is 11 tons per unit. The other three main hauling trucks are Sterling tractors and Myers semi-trailers which carry an average load of 13 tons. Special rock bodies with 2 inches of wood between steel plates on sides and bottom, are used, and have stood up excellently under the pounding to which the rock has subjected them. The round trip between





● *These two drawings show loading of hole No. 7, and results from shooting this hole.*

AT ARKANSAS PORTLAND CEMENT CO.

Cordeau-Bickford Detonating Fuse and Ensign-Bickford Safety Fuse

A perfect team where teamwork counts. Cordeau-Bickford detonates all loads and connects all holes. It permits split-second rotation, relieving burden, and gaining the greatest efficiency from every pound of explosive used. With Cordeau each cartridge goes with the force of a primer cartridge, thus resulting in better fragmentation.

A Cordeau hook-up may be detonated with a single cap. When Ensign-Bickford Safety Fuse is used to activate the cap—as it is here—the perfect team is in operation. Cordeau with its distinct advantages and Safety Fuse—inexpensive, positive, and reliable—form a combination that makes for lowered operating costs and greater efficiency.

Cordeau-Bickford Detonating Fuse is manufactured with the same precision that has made Ensign-Bickford Safety Fuse famous since 1836. Let us send you our Centennial Book—and tell you more about Cordeau and Safety Fuse.

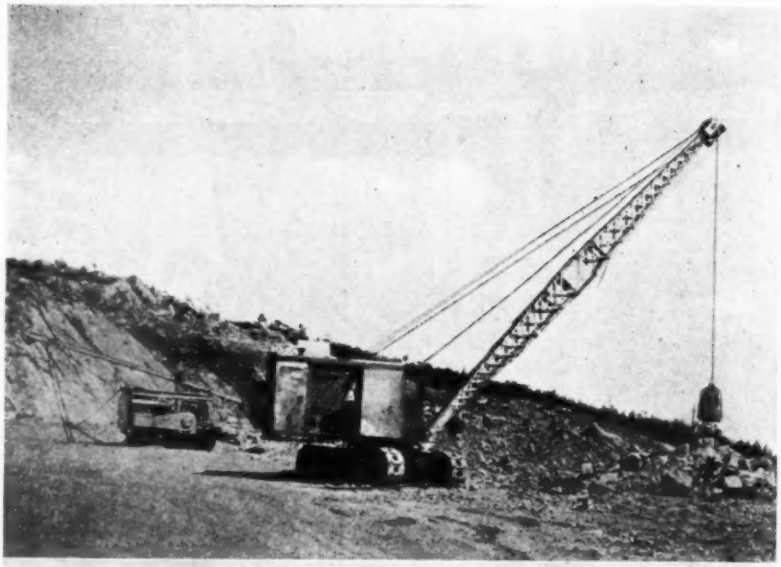
1836 BEGINNING A NEW CENTURY 1936 · ENSIGN-BICKFORD SAFETY FUSE ·

CB-56

The ENSIGN-BICKFORD COMPANY, Simsbury, Connecticut
SAFETY FUSE Since 1836 • CORDEAU-BICKFORD DETONATING FUSE

For your convenience in writing to The Ensign-Bickford Company, you will find a card bound in this issue.

● *Top: The Bucyrus-Erie Gas+Air is shown here rigged as a crane, with the "skull-cracker" used for shattering oversize. Much costly secondary blasting was avoided by this method. Center: Loading the rock—the 1¼-yard dipper of the P&H acts as a grizzly—rock which will pass through it being small enough for the jaw crusher. Bottom: The left section of the building at the right houses the sharpener for jackhammer and drifter bits; the right section, the two compressors. Building in center is storage shed.*



quarry and plant, including loading and unloading time, averages one hour.

Two trucks are held in reserve for use when it may be necessary to lay one of the main units up for repairs. Miscellaneous trucking jobs are done with a small Ford, and an old Mack is kept for snow plow duty in the winter.

An excellent graveled county highway runs from Wausau past the shoulder of Rib Mountain, with a branch leading up about half a mile to the quarry. Part of this branch is privately owned, and is maintained by Foley Brothers with a Caterpillar motor patrol. To save time and increase safety on the haul, several curves have been straightened, and the branch is well kept up.

Auxiliary Equipment

Equipment at the quarry in addition to that already mentioned includes an Ingersoll-Rand L 74 drifter for drilling reliever holes, and Ingersoll-Rand and Gardner-Denver jackhammers. Power for these comes from compressors housed in a corrugated iron shed east of the quarry face. Ordinary loads are handled by a Sullivan stationary compressor driven by a 105 h.p. Waukesha engine. A portable Chicago Pneumatic compressor can be cut in to help with heavy loads.

Ingersoll-Rand 1-inch cleanbore hexagon drill steel is purchased, and jackhammer bits fashioned from it on the job, using an I-R model 24 bit sharpener run by compressed air. The Bucyrus-Armstrong blast hole bit dresser is located in a near-by shed.

Maintenance

Maintenance on the Bucyrus-Armstrong 29-T has not been a serious problem. The machine is

about

ELECTRIC POWER SHOVELS

You'll find that the overwhelming preference for electric shovels equipped by General Electric is based on their proved ability to stay on the job* day in and day out, handling maximum yardages at low cost. Back of this reputation for profit-building performance is a thorough knowledge of power-shovel requirements—a knowledge gained by years of close co-operation with outstanding shovel builders.

Operators all over the country have proved for themselves that G-E equipped shovels are sound investments. Why not prove it for yourself? You'll find that they are excellent means for keeping down over-all operating expenses. General Electric, Schenectady, New York.

*One contractor told us that he took his G-E equipped shovel out of service temporarily, not because it was necessary, but because he felt that any equipment that had been in operation for five years without interruption should have a rest.

020-297

GENERAL ELECTRIC

For your convenience in writing to General Electric, you will find a card bound in this issue.

● *At present, the quarry is being worked in two 50-foot lifts. The Bucyrus-Armstrong 29-T is drilling at the top of the upper one, shown at the left. The smooth slope at the right is a 100-foot face. Note the slope and the scamed formation.*

greased every shift and the oil changed at regular intervals. Each operator keeps cards on which he records all operating data for his shift. This "running inventory" provides a constant source of information which permits discovering and checking any trouble before it gets started. Despite the arduous aspects of the work, the drill has given remarkably trouble-free service.

The dipper of the loading shovel is subject to severe usage, so steel wearing plates are riveted to the bottom.

Necessary repairs are made at the quarry except in the case of the trucks, which are serviced at the company's garage, located where the branch joins the county highway. Built of Wausau-manufactured concrete blocks, the garage has a main storage section and two wings. One of these houses the heating and lighting plant, a compressor, and battery charger. The second wing is the repair section.

Winters are tough at Wausau, bringing with them plenty of snow which threatens to close the road from the quarry. Last winter the temperature dove as low as 40 degrees below zero and hung at 20 below for a sustained stretch. Operations went right ahead, however. Use of the Mack truck pushing a plow, together with the excellent work of the county highway department on the main road, kept a route clear.

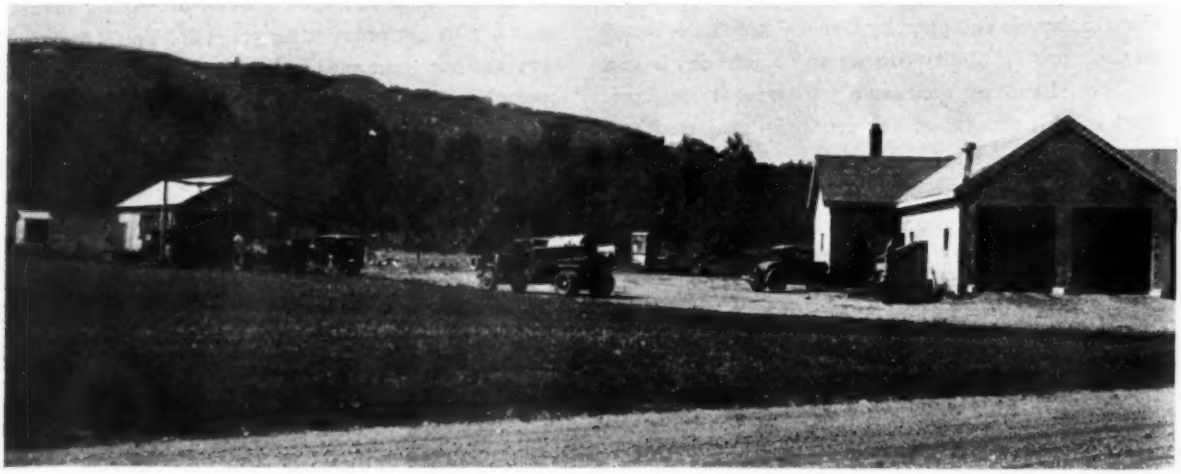
Foley Brothers are taking no chances with blocked roads, however, and maintain a stock pile near the plant site. Should the supply stream from the quarry be broken, a Marion 37 steam shovel is ready to be steamed up for loading from the stock pile to keep the plant operating.

● *At the junction of the county highway and the private road leading up the shoulder of Rib Mountain to the quarry, Foley Brothers maintain this garage. The main section is for storage, the left wing contains heating and battery-charging plants, and a compressor. The right wing is the main repair shop.*

Personnel

Foley Brothers personnel on this job includes: C. M. Thor, superintendent; Thomas Gannon, day foreman and master mechanic; Walter Wiederhoeft, night foreman; Harry Dorvinen, bookkeeper; George Zweck, Melvin Lang, and Peter Johnson, drill operators; and Frank Huedner, drill sharpener. These men all deserve a good share of credit for the alert and efficient way their jobs are being handled. Their interest, beyond the mere putting in of hours of work, is evident throughout.

We are particularly indebted to Mr. Thor for the interest and courtesy he showed in making available this material.



REAL PERFORMANCE

A DRILL IS ONLY AS GOOD AS ITS PARTS

THE PISTON

made of the finest material, heat-treated for the greatest strength, hardened for long wear, ground and finish lapped to exact size and smoothness—will not sliver.

THE SIDE RODS

reduced in section, localizing the V portion of the threads, and relieving the stress and strains, diminish breakage.

THE HEAD, CYLINDER, CHUCK HOUSING AND THROTTLE HANDLE

are machined from Drop Forgings made of electric furnace, fine grained, alloy steels, and these are carefully heat-treated as are all the parts.

THE SPOOL VALVE

and valve parts, the design and material of which make breakage an unheard of thing, give low air consumption.

THE CHUCK PARTS

are designed to give maximum wear.

THE RATCHET PARTS

consist of the new, reversible-locked-pawl device which serves to increase their life.

★

A thorough examination can only serve to show you why an L-2 gives real performance. Put L-2's on your job and thereby discover the real value this machine has for you!

SULLIVAN'S NEW **L-2** 45-LB. ROCK DRILL

SULLIVAN MACHINERY CO.

307 N. MICHIGAN AVE., CHICAGO, ILLINOIS

SULLIVAN makes Rock Drills & Accessories, Air Compressors, Detachable Bits, Coal Cutters, Hoists, Core Drills.

For your convenience in writing to Sullivan Machinery Co., you will find a card bound in this issue.

SHOTS *from the Firing Line*

Flood Control Moves Ahead

WHILE army engineers in the lower Mississippi Valley are making strenuous preparatory efforts to execute the Markham plan as embodied in the Overton Flood Control Act, U. S. Engineer Offices over the country are swinging into action making surveys and detailed plans for various flood control projects authorized by the Wilson-Copeland Omnibus Act.

More than $12,000,000 has been allocated recently to the Corps of Engineers from regular funds and from PWA funds to finance the surveys and the making of detailed plans.

River valleys in which surveys are under way include the Merrimac, Connecticut, Susquehanna, Ohio, Wabash-White, Arkansas, Kansas, Los Angeles and San Gabriel. This activity, in conjunction with the preliminary work under way in the lower Mississippi Valley, presages a banner construction year in 1937.

Speaking in New Orleans recently to the Board of Directors of the Mississippi Valley Flood Control Association, of which he is president, and F. D. Beneke is secretary-treasurer, United States Senator John H. Overton of Louisiana said:

"The most important work immediately is to see that Congress annually appropriates as much money for flood control as the army engineers can expend advantageously and economically in the execution of the Overton Act. When that is accomplished, we, in the lower valley, will be safe from the overflow.

"The principal work remaining is to take of the tributaries as far as we possibly can. The Omnibus bill is not entirely satisfactory to me. The requirements for local contributions as written into the bill will be difficult to carry out. Yet, I am sure that Congress and the Federal Government will always require some measure of local contribution. I wish we might do something to assure some reservoirs on the Arkansas and White Rivers as an added factor of safety. The tributaries must be cared for by amendments or by special legislation.

"Army engineers are now making preparations to execute the Markham plans as authorized by the Overton Act. The task of increasing the carrying capacity of the Atchafalaya River and floodway is being prosecuted vigorously. Surveys are under way to find the most satisfactory outlet to the Gulf to be dredged west of Berwick. Some thirty appraisers from the Forestry Service are at work in the Morganza floodway, and will complete their work within three weeks. I understand that about eighty appraisers from the Department of Agriculture are now at work or soon will be, in the Eudora Floodway. Detailed plans for flood protection on the St. Francis and Yazoo Rivers, and for the White River emergency reservoir, are being worked out. Revetment and dredging operations are under way.

"General Markham told me about two months ago that Congress had provided him with sufficient funds for all the work that can be done this year. He had on hand about $28,000,000 at that time. We must make sure that Congress appropriates all the money that will be required for the purchase of flowage rights, plus all the funds needed for construction work, next year. We may ask for as much as $75,000,000 initially. We ought to have at least $50,000,000 a year for construction work for the next six years."

World Power Conference

HELD in Washington, D. C., September 7-12, the third World Power Conference brought out clearly the international need for expansion of power plants. The curtailment in power use during the depression resulted in a severe check on growth of power plants. Now that use is again increasing rapidly, demand is approaching capacity so fast that expansion is essential.

Papers and discussion by representatives of many countries seemed to indicate two schools of thought with regard to development of national power sources. One group felt that each country should develop its potentialities fully; the other that local development should be sought only when it would result in obtaining power cheaper than could be bought from surrounding countries with more favorable conditions. The latter point of view was emphasized particularly in discussion of planned use of world water power.

Subjects covered at the conference included: national power and resources policies; national and regional planning and their relation to conservation of natural resources; significant trends in the development and utilization of power resources; planned utilization of water resources; utilization of small water powers; organization of the production, processing and distribution of coal and coal products and of petroleum and petroleum products; organization of the production, transportation, and distribution of natural and manufactured gas; conservation of coal, oil and gas resources; organization and regulation of private electric and gas utilities; organization and financing of publicly owned gas and electric utili-

• *You can't get away from the ancient order of shovel watchers —even down on the farm. Here Vernon County Highway Department is using its Bucyrus-Erie 10-B cleaning and straightening an old creek near Hillsborough, Wisconsin. The attending crowd may not be large, but it is interested.*

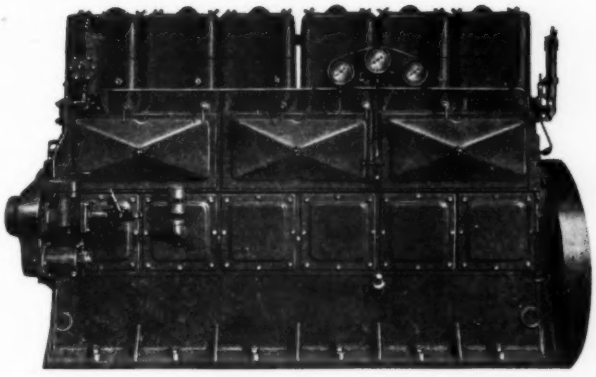
YOU CAN'T BEAT this combination

When you combine the advantages of reliable and economical Atlas Diesel power with the high output capacity and remarkable soft-ground mobility of the Bucyrus-Monighan Walking Dragline Excavator, you have a combination that spells satisfactory operation and good profits for the levee builder.

Designed especially for work where long booms, big output and soft-ground maneuverability are requisite, this Atlas Diesel powered unit is the answer to the present trend toward light weight equipment which can handle maximum yardage at minimum cost, and which can be readily shipped from one job to another.

Above is a picture of one of these remarkable Bucyrus-Monighan Walking Dragline Excavators powered with a 6 cylinder 200 H.P. fully enclosed Atlas Imperial Diesel. It is shown in levee construction work near Morton, Mississippi, in the service of the Domingos Construction Co., and according to the owners, the performance of this unit has far exceeded their expectations.

When you have a dirt moving job that is a big one, on which the margin of profit may be close—buy



Atlas Diesels of the fully enclosed type illustrated above are available in 3, 4, 6, and 8 cylinder models in the following range of horse powers: 45, 60, 80, 90, 120, 140, 150, 165, 200 and 275.

an Atlas Diesel powered shovel or dragline and be assured of reliable power at the lowest possible cost. Atlas Diesels pioneered the excavating field and there are today more Atlas Diesels powering shovels and draglines than the engines of all other Diesel manufacturers combined. Your inquiries are solicited and given prompt attention.

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIFORNIA :::: MATTOON, ILLINOIS

ATLAS IMPERIAL

For your convenience in writing to Atlas Imperial Diesel Engine Co., you will find a card bound in this issue.

RED ARCH Dragline Buckets

for

a faster cycle

RED ARCH dragline buckets are built for speed! They fill quickly, carry easily, and dump freely . . . moving more dirt per pass and making more passes per hour. This faster cycle rate, combined with the great strength and long life built into Red Arch buckets, make them the choice of operators who want the maximum in low-cost, high-output performance. Available in three styles and all sizes . . . send for bulletins today. 204

BUCYRUS ERIE

BUCYRUS-ERIE

EXCAVATING, DRILLING & MATERIAL-HANDLING EQUIPMENT • • SOUTH MILWAUKEE, WIS.

ties, regional integration of electric and gas utilities; rationalization of distribution of electric energy and gas; rural electrifiaction; and collection, compilation, and publication of statistics, with particular reference to international use.

The International Committee on Large Dams held its second Congress in Washington concurrently with the power conference. Papers and discussion were pretty well confined to technical aspects of construction details. Five sessions were held, one being given over to each of the following topics:

Joints in dams
Facing of masonry and concrete dams
Special elements
Foundation studies
Stability of earth dams

As was the case at the power conference, papers had been prepared in advance, and summarized by general reporters to expedite proceedings and facilitate discussion.

New PWA Allotments Approved

IN a letter to Representative Alfred Beiter of New York, President Roosevelt gave assurance that the public works program of non-federal projects would "go forward without interruption."

The President continued in the letter:

"Recently I approved PWA projects amounting to approximately $22,000,000 on which construction will start within the next few weeks. I expect to announce an additional group shortly.

"As all these projects will be constructed through the agency of general contractors, I am sure that they will have a beneficial effect upon the construction industry."

This letter was dated September 8. On that date, the President approved allotment of $7,438,338, and on September 12, an allotment of $7,721,116, with loans of $317,000 and $195,000. The September 12 allotments were the first made entirely from the $300,000,000 made available by the last Congress. All grants were for 45 per cent of the cost of projects involved.

Use of Explosives in First Half of 1936

DURING the first six months of 1936, there were consumed in the United States 30,249,819 more pounds of industrial explosives than in the corresponding period of the year before, according to statistics just released by the Institute of Makers of Explosives.

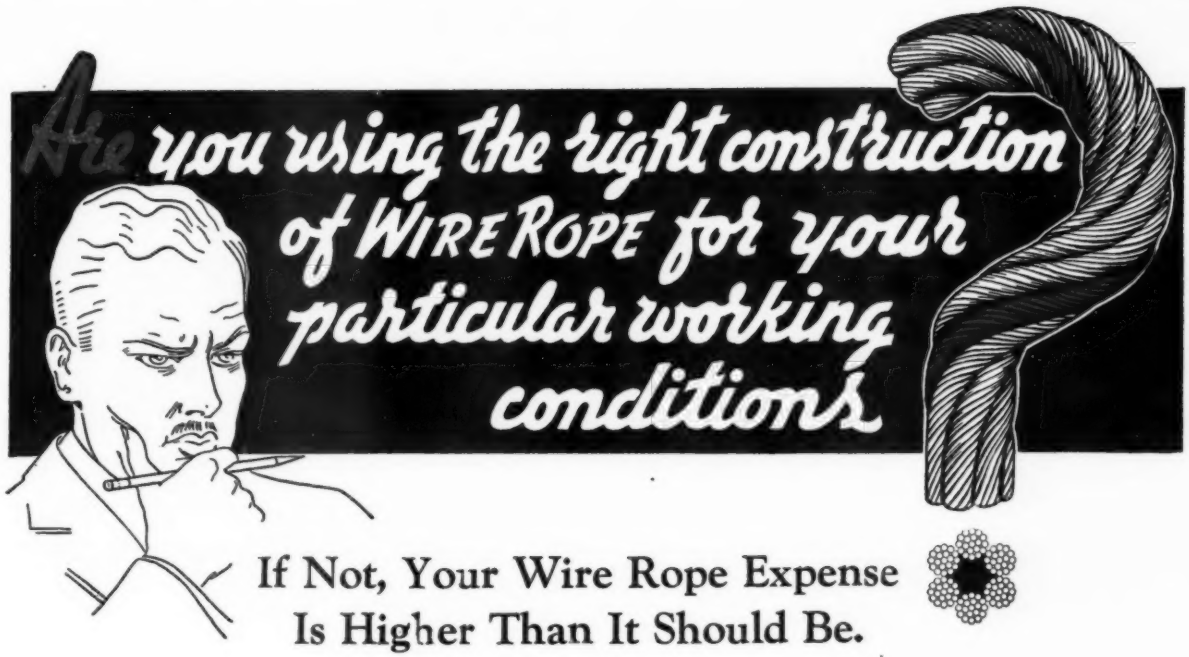
For the first half of the year, the total consumption for all commercial purposes throughout the country was 170,773,977 pounds, compared to 140,524,158 pounds in the first half of 1935.

Coal mines, as usual, were the largest consumers of explosives, but the greatest gain in the number of pounds consumed was made by construction projects, while the country's ore mines led all other industries in their percentage of gain.

This year, up to the end of June, coal mines used 63,811,123 pounds of explosives. This represented a country-wide advance of 4,871,038 pounds over the same span in 1935. For this pur-

● *Governor Merriam of California broke ground with a gold shovel at ceremonies on the island being filled by U. S. Army Engineers as the site for San Francisco's 1939 Exposition. Behind the Governor, left to right, are: A. C. Charlton, Consul General of Great Britain and Dean of Consulor Corps in San Francisco; Mayor McCracken of Oakland; George Creel, Golden Gate Exposition director; Mayor Angelo Rossi of San Francisco; Frank Belcher, San Diego Exposition president; L. B. Cutler, Gold Gate Exposition president; Colonel Dorst, in charge of U. S. Army Engineers' dredging activities at this site; Frank McLaughlin, California WPA administrator; and Joseph Knowland, publisher of the Oakland Tribune.*

For your convenience in writing to Bucyrus-Erie Company, you will find a card bound in this issue.



If Not, Your Wire Rope Expense Is Higher Than It Should Be.

Some conditions require a rope that must be extra flexible, some need a rope able to withstand drum crushing, others require a rope that can stand up under excessive wear and stress, and there are times when a combination of severe conditions must be met.

No one type of rope will give maximum results for all conditions. To give 100% service, wire rope must be of the right construction to fit the particular conditions under which it is to work. For example, if you have a condition which requires a strong, durable rope to withstand excessive wear and stress, do not use a rope whose chief characteristic is flexibility, if that flexibility has been developed at the expense of wearing qualities.

So that you will receive the maximum in service by avoiding misapplication, we make "HERCULES" (Red-Strand) Wire Rope in a wide range of constructions, including Round Strand, Flattened Strand, Preformed, Non-Rotating, and Steel Clad Types.

Write us today if you are not sure that you are using the right construction of wire rope to fit your particular working conditions. Our Engineering Department will be glad to help you.

"HERCULES" REG. U.S. PAT. OFF. RED STRAND WIRE ROPE

Made only by **A. LESCHEN & SONS ROPE CO.** *Established 1857*

5909 Kennerly Avenue, St. Louis, Mo.

New York - - - - - - - 87 to 90 West St.
Chicago - - - 810 West Washington Blvd.
Seattle - - - - - 2244 First Ave., South
Denver - - - - - - - 1554 Wazee St.
San Francisco - - - - - 520 Fourth St.

For your convenience in writing to A. Leschen & Sons Rope Co., you will find a card bound in this issue.

pose Pennsylvania was the largest user, requiring 25,145,235 pounds.

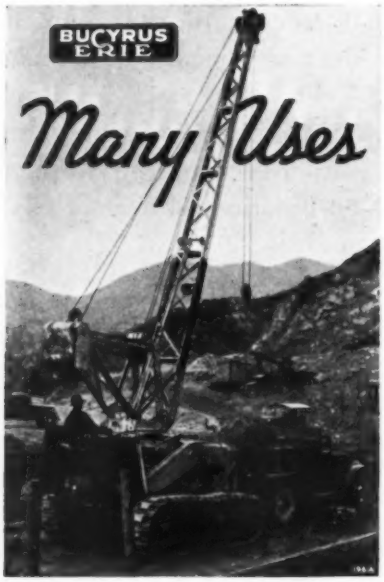
Construction enterprises took 47,149,945 pounds, 9,980,334 pounds in excess of last year. California, as in 1935, this year led all states in the consumption of explosives for this purpose, employing 8,137,185 pounds.

The mining of ore required 30,626,874 pounds of explosives. This was 8,577,167 more pounds than were needed the year before. Also, for this purpose California led all states, demanding 3,742,153 pounds.

United States quarries and nonmetallic mines used 23,219,240 pounds in the first half of 1936, as against 17,932,906 pounds in 1935. As in coal, Pennsylvania led all states in consumption for this purpose, making use of 4,391,269 pounds.

In connection with quarrying, it has been established that approximately a thousand pounds of explosives are needed to open the way for and to supply crushed stone to every mile of highway constructed in the country.

The statistics also show that from January to June, 5,966,795 pounds of explosives were in demand for a variety of other purposes, including agriculture, in which dynamite is being employed increasingly for ditch blasting, tree planting, and for what has become known as "house cleaning" on the farm, such as stump and boulder blasting, subsoil drainage and other similar purposes.



THE seven-ton capacity, 30-foot boom, and tractor mobility of the "60" Loadmaster give it a wide range of uses. It is the ideal utility crane—loads and unloads trucks and cars; piles materials; helps in construction work; raises or shifts tracks; drives piles; sets poles; handles concrete forms, oversize rock, pipe, lumber and ties. Send for illustrated bulletin.

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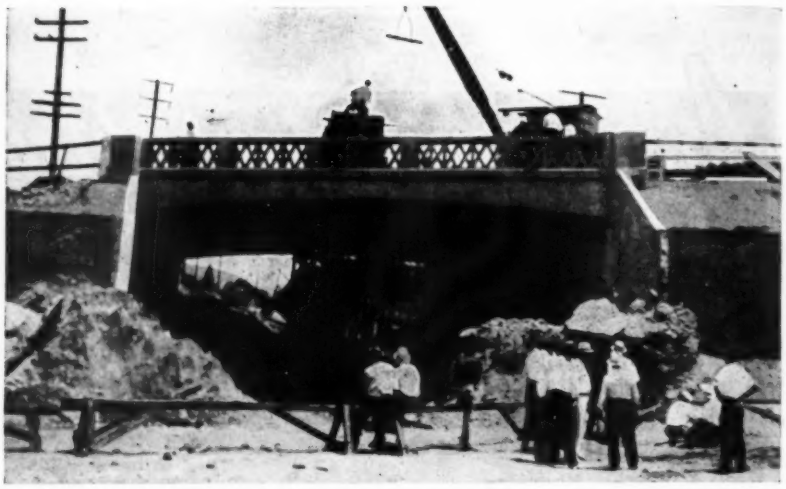

Iron Ingots Crack Bridge in Test

By John R. Marcy

THIS concrete bridge in Glendale, California, had to come down anyway in the course of a flood control project, and because it was a new type called "rigid frame and skewed arch," designed by Cal-Tech engineers, it was desired to see just what the design was capable of withstanding. Iron ingots weighing over a ton each were placed across the center of the bridge on beams laid along a 30-inch strip. At each corner of the bridge three gauges registered the stresses and movements of the structure from all directions. The ingots were placed by a crane until at a load of 340 tons the bridge began to crack. Army, state, and local engineers were present to watch the experiment.

Future for Coal

AT present consumption rates, coal reserves in the United States should last several thousand years, according to W. A. Selvig of the U. S. Bureau of Mines.

Only about one per cent of our original coal reserves have been consumed. The estimated three-and-a-half trillion tons remaining make the United States the repository for about half the world's supply. Consumption has been chiefly of high grade, high rank coals with the result that reserves of these coals are low compared to those of low rank bituminous, sub-bituminous and lignite.

Since 1929, according to Mr. Selvig, there has been a steady decline in the amount of coal consumed. This drop has been largely due to the growth of oil burners for industrial and domestic heating; to the replacement of some coal burning trains by gasoline-driven automobiles, buses and trucks; and to the growing use of oil burners in ships.

Known oil reserves, Mr. Selvig pointed out, will last only about 15 years at the present rate of consumption. New reserves will be discovered, but at a decreasing frequency. Consequently, it may be necessary to supplement oil with liquid fuel from coal within the present generation.

The following table, prepared by the Bureau of Mines, shows the percent of total heating value contributed by the several mineral fuels of the United States.

	1913	*1923*	*1934*
Anthracite	14.4	10.9	8.4
Bituminous coal	72.7	62.4	50.8
Total coal	67.1	74.3	59.2
Oil	9.3	21.1	30.5
Natural gas	3.6	4.6	10.3
Total mineral fuels	100.0	100.0	100.0
Water power	3.4	4.9	10.2

(Continued on page 542)

The Crane-Time Saver!

Williams "Champion" Power-Arm Bucket

Unusually fast acting and powerful, because of shorter cable overhaul and exclusive power-arm arrangement of lever and block-and-tackle.

We also build Williams Power-Wheel, Multiple-Rope and Dragline buckets.
Write for new bulletin

THE WELLMAN ENGINEERING CO.
7002 Central Ave., Cleveland, Ohio

WILLIAMS BUCKETS

AMERICAN TIGER BRAND

strong flexible

READY FOR ANYTHING!

AMERICAN TIGER BRAND WIRE ROPE

AMERICAN Tiger Brand Wire Rope has done every kind of job in construction from excavating to hoisting materials. And every day it is given new jobs to do because over a period of years it has shown its ability to "take it".

American Tiger Brand Wire Rope is available to you in every type and size you need. It is made of the right steel which we control from the raw material all the way to the finished product — a control that saves dollars on the job. The service back of American Tiger Brand Wire Rope will save you time and trouble.

AMERICAN STEEL & WIRE COMPANY
208 South La Salle Street, Chicago
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Pacific Coast Distributors: Columbia Steel Company, San Francisco · *Export Distributors:* United States Steel Products Co., New York

US STEEL

UNITED STATES STEEL

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Black Canyon Canal Award

J. A. TERTELING & Sons, of Boise, Idaho, have been awarded the contract for construction of four tunnels and two sections of the Black Canyon Canal of the Payette Division of the Boise Federal Reclamation project on their bid of $292,796.

The successful bid was the lowest of five received and opened by the Bureau of Reclamation at its office at Ontario, Oregon, July 27.

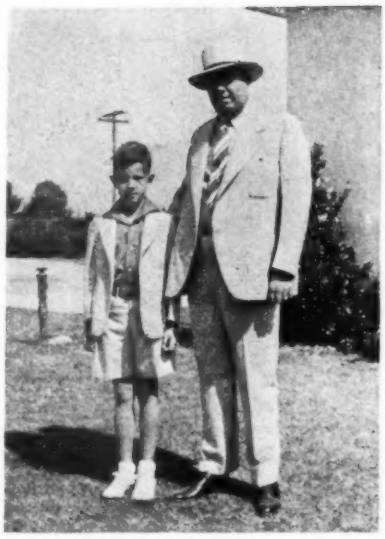
The work involved consists of construction of Tunnels Nos. 3, 4, 5, and 6, and two short sections of the canal with the necessary structures.

The tunnels will be horseshoe-shaped of 14 ft. diameter. The four tunnels, together with the canal sections involved, will have an over-all length of about one mile. The tunnels will be 1,400 ft., 1,270 ft., 670 ft., and 870 ft. in length, respectively. Tunnels Nos. 1 and 2 on the canal already are under construction.

The contractor will be required to complete the job in 400 calendar days.

National Waterway Contractors' President

WHEN the former Mississippi Valley Flood Control Branch of the Associated General Contractors of America recently was converted into the National Waterway Contractors' Association with headquarters at Memphis, Tenn., the dirt movers unanimously elected D. D. (Dave) Coleman president of the new organization.



Mr. Coleman is a native of Indiana and is one of the most successful of America's younger construction men. He has engaged in excavation work of all kinds all the way from Minnesota to Key West. He was active in dredging work during the boom-days in Florida and then moved into the Mississippi Valley to engage in levee building with big boom draglines. He is secretary-treasurer of the Valley Construction Company. Shown with him in the accompanying illustration is his nine-year-old son, "Micky."

Giant Conveyor Belt

MANUFACTURE of what is believed to be the largest roll of conveyor belt ever made, has just been completed by United States Rubber Products, Inc. In addition to establishing itself as the jumbo of the belting realm, this new belt lays claim to being the biggest single piece of mechanical rubber goods ever produced. There have been a few longer belts, some wider, but never has there been one combining so much length, width and thickness.

The belt, a U. S. Matchless, is 1,355 feet long, 60 inches wide, and has 10 plies. Rolled and crated ready for shipping it stood 11 feet 2 inches high and weighed over 16 tons. Due to its mammoth size, the belt had to be specially routed by the railroad so that it would have overhead clearance on its way to Arizona, where it is to be used by a large copper mining unit company.

Experiment With New Highway Building Method

By Henry P. Unger

A NEW process, called the "puddle process" of road building is being tested in Fredericksburg, Va.

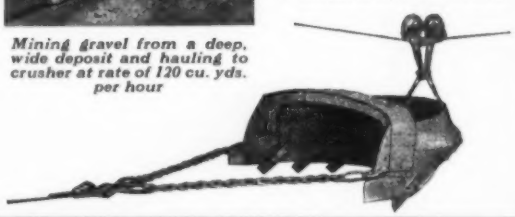
The new process was discovered by accident. During the building of an airport, a part of the field was

SAUERMAN

SLACKLINE SCRAPERS

Sauerman Scraper, operated by crane, hauls dirt 250 ft. onto embankment.

Mining gravel from a deep, wide deposit and hauling to crusher at rate of 120 cu. yds. per hour



You can make larger profits on many dirt-moving jobs by using Sauerman Scrapers.

Any two-drum hoist or boom machine can be used as a power unit.

Handling capacities will range from 10 to 600 cu. yds. per hour, depending upon the size of Sauerman Scraper you use. Operating spans may extend as far as 1,000 ft. or farther.

Write for Catalog

SAUERMAN BROS.
474 S. Clinton St.
CHICAGO, ILLINOIS

FIRST...

of its Type with 15 Inch Wheels

LaCrosse Trailers were the first to be equipped with the 15 inch wheels and small diameter pneumatic tires.

LaCrosse Trailers mean lower operating platform and more pay load. Don't buy a trailer without sending for complete details.

CAPACITY 5 TO 50 TONS

C. R. Jahn Co., LaCrosse, Wis.

HAYWARD BUCKETS

PLAY SAFE . . .
CHOOSE HAYWARDS

Hayward Buckets won't fall down on the job, cause time out, or require costly repairs.

THE HAYWARD COMPANY
52-54 Church Street
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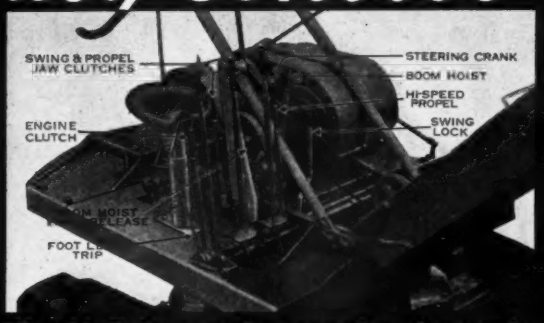
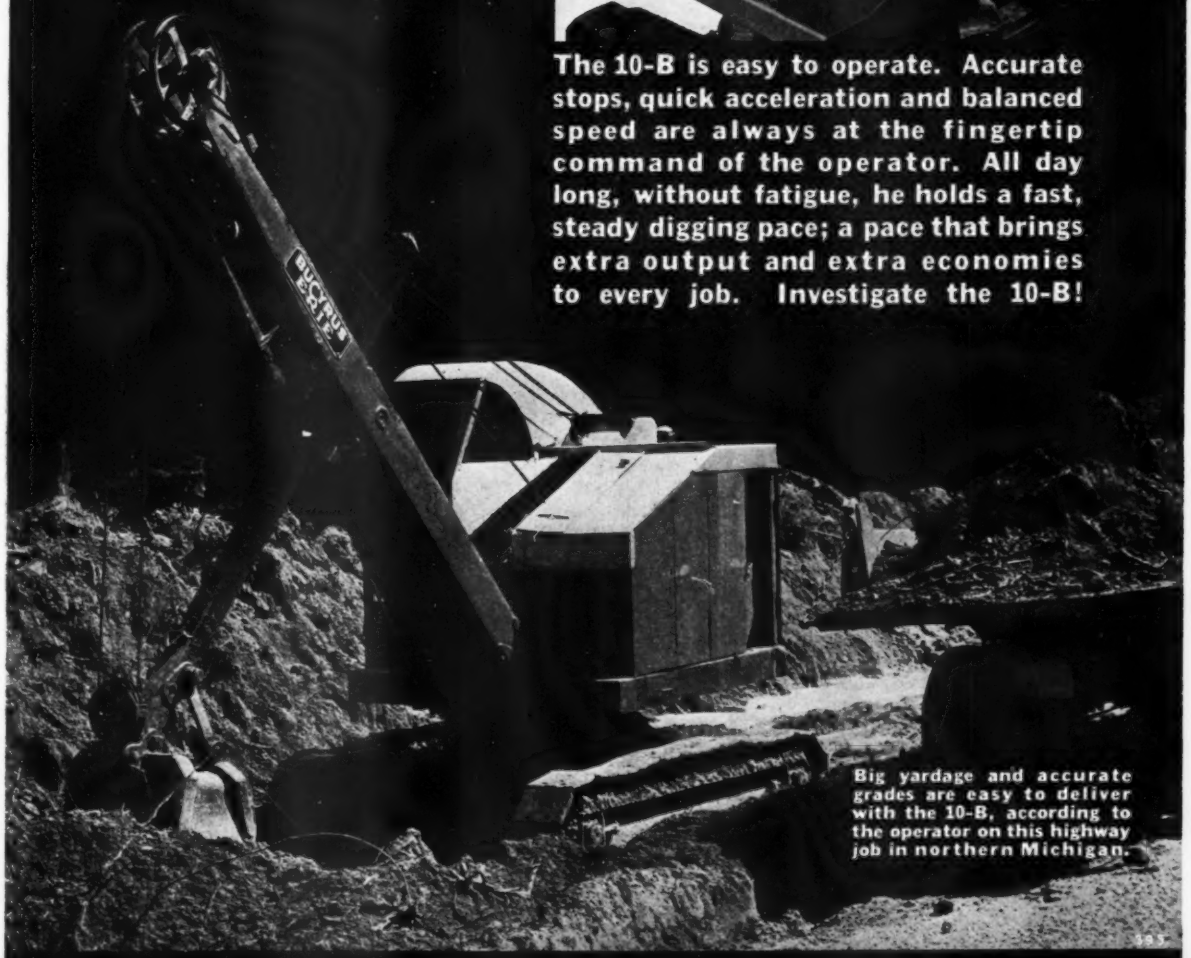
Easy Control



The 10-B is easy to operate. Accurate stops, quick acceleration and balanced speed are always at the fingertip command of the operator. All day long, without fatigue, he holds a fast, steady digging pace; a pace that brings extra output and extra economies to every job. Investigate the 10-B!



Big yardage and accurate grades are easy to deliver with the 10-B, according to the operator on this highway job in northern Michigan.

BUCYRUS ERIE

EXCAVATING, DRILLING, AND MATERIAL HANDLING EQUIPMENT... SOUTH MILWAUKEE, WISCONSIN, U.S.A.

For your convenience in writing to Bucyrus-Erie Company, you will find a card bound in this issue.

drenched in a heavy rainfall and would not dry rapidly. Plowed, smoothed over and left as hopeless, this portion of the field two weeks later was found to be the firmest and smoothest. In a month the section was like a concrete landing surface.

As a result, road building experts are building a four mile road in the Fredericksburg Battlefield Park by the new process. This road will be used as an experiment to see how well it survives the frost and truck traffic.

Under the "puddle process," a thin gravel base is laid down. On top of this is spread a mixture of gravel, sand, asphalt, oil and water. Then the whole mass is plowed until it is a sort of thick black mud. Finally, it is rolled under a 15-ton roller and left to dry. Slowly the mixture hardens until it looks like black concrete.

The engineers building the new road believe it will be impossible for water to soak through the foot-thick "puddled" mixture and that no damage will occur due to the frost.

Lewis-Chambers Low Bidders on 1,626,000 Yards

LEWIS-CHAMBERS Construction Company were low bidders on 1,626,000 cubic yards of earthwork advertised by U. S. Army Engineers at New Orleans. Fifteen bids were opened on September 2nd for eleven items. Lewis-Chambers bid of 9.23 cents for all eleven was the lowest of the fifteen.

Diesel Tractors in Thrilling Movie Role

JOE E. BROWN, world-famous comedian, is teamed with Diesel track-type tractors in Warner Brothers recent motion picture release, "Earthworm Tractors."

"Earthworm Tractors" is the screen version of the series of stories by William Hazlett Upson in a leading weekly magazine. Brown plays the role of the super-salesman hero, Alexander Botts. Opposite him is lovely June Travis as Mabel Johnson. Guy Kibbee is Cyrus Johnson, her father, who is Botts' most stubborn prospect.

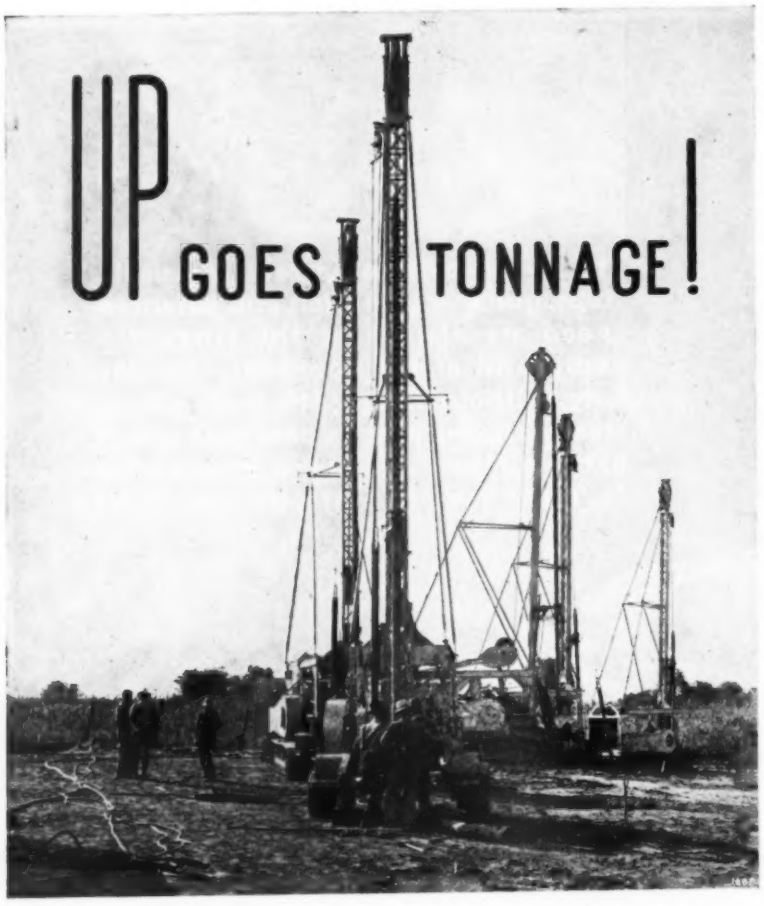
The series of hair-raising and impromptu tractor demonstrations that mark the progress of the plot, eventually win the girl and a sizable tractor order from her father. And while Brown enacts his role of "natural born salesman," the tractors are proving themselves able performers, too. All tractors in the picture are "Caterpillar" Diesels, and during the filming, the Caterpillar Tractor Co. plant at Peoria, Ill., was taken over by Warner Bros. cameramen for days.

Director Raymond Enright and screen writers, Richard Macauley, Joe Traub and Hugh Cummings, vied with one another in arranging spectacular and difficult feats for the tractors to perform and the Diesels nobly responded, according to machinery men critics interested in the technical side of the picture. In one sequence, a 16-ton Diesel tractor plunges into a man-made swamp. Driverless, it breasts through the deep mire; wrecks a truck, smashes through a fence, crashes over logs and rocks, and ends its sensational flight by hurdling an automobile. In another scene Supersalesman Botts, who "knows all about tractors," but little about the gear shift, demolishes a railroad station with the attendant smashing of egg cases and milk cans.

All in all, the picture proves that tractors can produce fun as well as results of a more strictly business nature.

"I tell you I won't have this room," protested the old lady to the bell-boy who was conducting her. "I ain't going to pay my good money for a closet with a measly little folding bed in it. If you think that just because I'm from the country—"

Profoundly disgusted, the boy cut her short. "Get in, mum, get in. This ain't your room. This is the elevator."



WITH a battery of Bucyrus-Armstrong 29-T blast-hole drills on the job, production capacity *goes up* and preparation costs *go down* per ton of rock prepared. For speed of drilling, ease of handling, economy of operation, ready mobility, and general all-around drilling performance, Bucyrus-Armstrong drills are the modern choice of up-to-date blast-hole drillers everywhere. Write for illustrated bulletins.

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More Yardage!

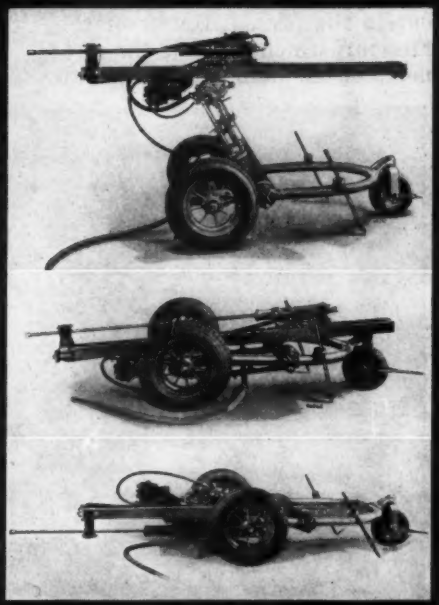
SPEED
POWER
FLEXIBILITY

The FM WAGON DRILL

The FM Wagon Drill makes the most powerful of I-R Drills as flexible as Jackhamers. More yardage can be obtained with less effort on the part of the operator. 20' holes are put down where you want them. Steel changes up to 6' can be accommodated.

A one-piece tubular frame combines lightness and rigidity. The FM mounting is so flexible and easy to adjust that there is practically no limit to drilling possibilities.

An air-motor-controlled pressure feed represents a distinct advance in the method of feeding wagon-mounted drills. For further information write for Form No. 2253.



The Type D Wagon Mounting can be used to put down 40' holes and accommodate 10' steel changes.

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407-5

For your convenience in writing to Ingersoll-Rand, you will find a card bound in this issue.

Fort Peck Dam

(*Continued from page 515*)

have an inside diameter of 24-feet 8 inches. Lined with concrete and steel, they will divert the waters of the Missouri during the final phase of dredging, and will also serve to control the release of water for navigation. The tunnels will have a capacity of about 70,000 second feet.

Flood flows in excess of this amount will be handled by the spillway, which has a capacity of 254,000 second feet. The spillway and tunnels combined, therefore, can pass a flood twice the size of the largest on record (154,000 second-feet in 1908).

The spillway is located in a natural coulee, about three miles east of the dam. It will be nearly two miles long, requiring over 14,000,000 yards of excavation. The latter was handled by shovels and trucks. An unlined approach channel 1,900 feet long will lead to the Stoney Gates, beyond which is 4,761 feet of concrete-lined channel terminated in a cut-off wall to prevent undercutting. An unlined channel leads out to the present course of the Missouri which bends to the east, north of the main dam. Sub-drain tile, in V-shaped trenches, underlies the paving.

• *Constructed in seven months, the town of Fort Peck resembles a permanent, bustling metropolitan suburb. Houses in the foreground are permanent residences for army engineers and civilian executives. Administration building and dormitories can be seen in background.*

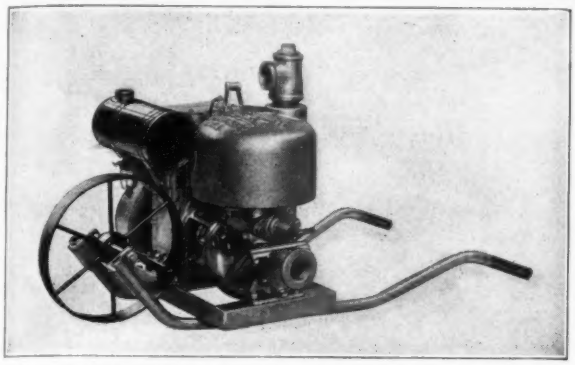
Shipping In the Aggregate

About 5,000,000 yards of material is required for concrete and for the toes and upstream face of the dam. Glacial deposits at Cole, Montana, 80 miles by rail from Fort Peck, are the source from which the material is loaded under contract and shipped to the dam. The Government supplies contractors at the dam with all necessary concrete aggregates from this source, as well as acquiring the supply needed for its own operations.

Major work being handled by the Government includes dredging operations and completion of the tunnel construction. Work on the latter was started by Mason & Walsh, but was turned over to the Government by mutual agreement. Stripping of the main damsite in 1934 was let to Addison-Miller, who sublet parts of the work to Dahlquist, Wachter O'Neil, Westley Christenson, and

• *This comparatively early view of the dam site gives an excellent view of the sheet steel cut-off wall. The towers in the right foreground are swinging special compressed air "spades" which greatly facilitated the driving.*

REX SPEED PRIME PUMPS
FULLY AUTOMATIC



★ *FASTEST PRIMING TIME*
★ *GREATEST AIR HANDLING ABILITY* *because of the Patented Rex Peeler*

CAPACITIES
7,000 TO 90,000 GALLONS PER HOUR
GET FACTS AND PRICES TODAY

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REX *Construction Equipment*

ADOPT GREDAG LUBRICATION
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FOR COLD WEATHER SERVICE

Grade 16 —For cables and open gears. A soft, very adhesive lubricant. Does not harden, crack or peel.

Grade 20 —For chain and enclosed gear drives, automotive transmissions and differentials, plain bearings and car journals. Fluid. Retains lubricating value at very low temperatures.

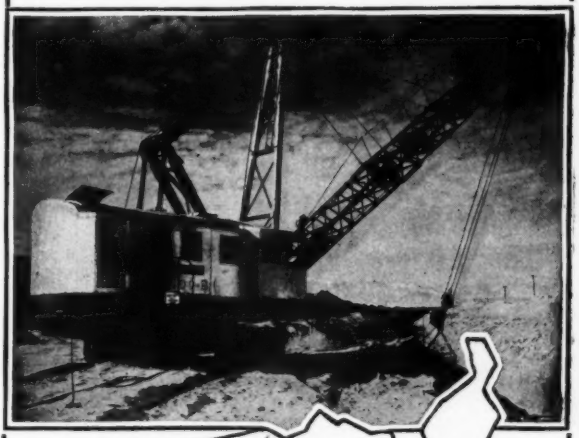
Grade 41 —For a wide range of medium and heavy duty enclosed gear applications, worm drives and elevator guides. Fluid.

Grade 51½—For ball and roller bearings, chassis bearings, automatic grease cups and pressure fittings. As soft a lubricant as can be made with cup grease characteristics.

GREDAG CUTS MAINTENANCE AND LUBRICATION COSTS

NATIONAL CARBON COMPANY, INC.
Carbon Sales Division, Cleveland, Ohio

● *This Bucyrus-Erie model 100-B Electric Dragline is operating on the Colorado River Aqueduct of the Metropolitan Water District of Southern California.* Powered by Westinghouse.



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Whether your shovels are at work in Pennsylvania's anthracite fields or in the copper mines of Colorado . . . they are always within over-night distance of *Westinghouse Service.*

Westinghouse service shops, 36 in all, are strategically located throughout the country. Manned with factory-trained experts and equipped for speedy, efficient work, they are ready day or night to make repairs when you need them most.

Remember, when you buy *Westinghouse* electric shovel drive, you not only get equipment that is built for tough jobs . . . you also know that expert service is never more than a few hours away.

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R 52020

Westinghouse
ELECTRIC SHOVEL DRIVES

For your convenience in writing to the advertisers on this page, you will find a card bound in this issue.

● *Spillway excavation speeded along despite snow and cold weather in winter and heat in summer. Temperatures at Fort Peck range in normal seasons from 110 above to 40 below.*

R. P. England. The central part of the stripping was handled by Allis-Chalmers, Adams and Caterpillar elevating graders loading GMC, Ford and Mack trucks. Shovels and draglines were used for stripping the abutment areas where the gumbo topsoil lay thickest. Altogether, this part of the work involved moving over 4,100,000 yards a layer ranging from 5 to 30 feet in thickness.

Spillway work was let in three contracts. One, for the lower section, went to Martin Wunderlich and involved 3,000,000 yards of excavation. Spillway Builders, Inc., were awarded another, which called for 10,000,000 yards of excavation, and placement of concrete lining for over 4,000 feet of the channel. The gate structure and a cut-off wall of concrete at the lower end of the lining is under contract with the firm of Addison-Miller, Inc., and Fielding & Shepley, Inc.

The Government has asked for bids for the various quantities of gravel needed. To date, all contracts have been awarded to J. L. Shiely Company and to the Becker County Sand & Gravel Company. These two contractors lease the pits at Cole, Montana, from private land owners.

At the end of August, 1936, 39,350,000 cubic yards of hydraulic fill had been placed in the dam. Fill-pipes on the dike section had been set for the final lift, which means that the Dredge Jefferson and attendant boosters are pumping against a 240-foot static head-record dredging performance. The month of August was the best so far for dredging, 4,300,000 yards going into the fill from the four dredges.

Lt. Colonel Thomas B. Larkin, District Engineer, is in charge of the construction operations at Fort Peck under Colonel R. C. Moore, Division Engineer with offices at Kansas City, Missouri. Officers of the Corps of Engineers who are principal assistants at Fort Peck are: Major Clark Kittrell, in charge of operations; Captain C. N. Iry, electrical power; Captain A. W. Pence, tunnels; Captain D. A. D. Ogden, construction of dam; Captain C. H. Chorpening, steel sheet piling cut-off wall; Captain R. Lee, executive assistant in charge of administration; Captain J. R. Hardin, spillway; and Captain E. G. Plank, land acquisition and town management.

This is the first of a series of articles on building Fort Peck Dam. The second article will describe dredging operations to date. Following installments will carry the stories of diversion tunnels and spillway. Watch for them.

Traveling for the TVA

(*Continued from page 517*)

Channel change excavation at town of Caryville—one day's work, 502 yards—bank measurement.

Roadway widening in Whitman's Hollow — thirty days' work, last half of July and first half of August, 1935, 18,700 yds. — working days eight hours—material practically all loaded in trucks.

Loaded on trailer, moved sixty miles from northern tip of Campbell County, unloaded and put to work near Norris, in Anderson County—all done under extremely strict safety regulations. Moved again from town of Caryville to Norris Village and unloaded — total elapsed time, 1 hour, 10 min.

Among other incidental, interesting jobs to which the 10-B contributed is the Caryville Dam, built to prevent unsanitary conditions, which might have resulted from changing water level at the edge of the attractive mountain village of Caryville.

When its job as traveling trouble shooter in Clinch Valley was completed, the 10-B was moved to another of the T. V. A. dams and used for the numerous auxiliary jobs for which it was fitted by its speed and mobility.

● *A good part of the success which TVA's "handy-man" shovel has had is due to the skill of operator A. L. Long, who has kept the machine in "fighting trim" ever since its purchase.*

Book Reviews

"Handbook of Engineering Fundamentals," a 1081-page book edited by O. W. Eshbach, EE, has been published by John Wiley & Sons Inc., New York. This book, the first in a new handbook series, deals with the fields of mathematics, physics, and chemistry as the basis of all engineering. "Eshbach" is designed to present in one compact, easy-to-handle volume, a complete summary of the facts pertaining to the fundamental theory underlying engineering practice. Every care has been taken to put the data together in the most readily usable fashion possible. Copies may be obtained for $5 each from the publisher.

"Model 'KO' Standard and Wide Tread Tractors" is the title of a new catalog issued by Allis-Chalmers Mfg. Company, Milwaukee. The catalog contains complete information on the new Model "KO" Diesel fuel tractor recently announced.

Features and improvements on the "KO" are described and illustrated. The principles of the controlled ignition engine, which have won wide-spread attention, are explained in clear, concise form and several pages are devoted to the simple, new injection system developed by Allis-Chalmers.

Fuel and lubricating systems are illustrated with cross-section views in color and important features of construction of the "KO" tractor are described.

Action pictures of the "KO" working on a variety of jobs are shown in the 32-page catalog. Copies can be secured from Allis-Chalmers dealers or branches located in all principle cities, or by writing to the Company at Milwaukee.

The publication of the **"Minerals Yearbook, 1936"** has been announced by the United States Bureau of Mines, Department of the Interior. The volume contains 69 chapters, 154 illustrations, and 1,136 pages, and provides in convenient form a comprehensive and accurate record of economic developments and trends in the mineral industries of the United States during the year 1935. In addition to a presentation of the fundamental statistics of the production and marketing of a hundred commercial minerals, world production of minerals and the economic aspects of international mineral policies are reviewed.

The Wellman Engineering Company, 7015 Central Avenue, Cleveland, Ohio, has recently issued bulletins describing four Williams clamshell buckets. These are: P3-49, describing the "Champion" line for heavy digging; P3-50, describing the cleanup-Rehandler; P3-51, illustrating the Williams "Hook-On" single line bucket for rehandling; and P3-57, discussing the line of multiple-rope buckets. Characteristics of each type of bucket are given in these bulletins, and specifications are included. Copies may be obtained by number from the manufacturer.

National Crushed Stone Association, Inc., has published "Stone Sand," a booklet by A. T. Goldbeck, which gives much valuable information about this crushed stone product. Characteristics of stone sand, methods and problems of preparation, and uses are thoroughly discussed. The booklet is well illustrated with diagrams, charts and photographs showing installations of concrete made using stone sand as fine aggregate.

Trade Notes

C. F. Mullins, machinery representative widely known in the western section of the United States, has been appointed Sales Engineer in the construction and governmental field for the **Caterpillar Tractor Co.,** San Leandro, Calif.

Immediately prior to his recent appointment Mr. Mullins was Western Representative for the Wehr Co. of Milwaukee, Wisconsin.

Mr. Mullins will cover Southern California, Southern Nevada, Arizona, and New Mexico for "Caterpillar" making his headquarters at Los Angeles, California.

POSITIONS WANTED

Positions wanted advertisements will be run under this heading for 5 cents per word, minimum charge $1.00. Advertisements for help wanted free of charge.

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

EXPERIENCED OPERATOR

Experienced shovel-dragline-crane - clamshell operator desires work anywhere, preferably in foreign country. Twenty years' experience includes work on gas, electric, Diesel and steam machines. Can do own repair work. Best of references. Present location West Virginia. Box 8006.

DRAGLINE OPERATOR

Operator experienced on levee, revetment and drainage work desires work on Bucyrus-Erie steamer, any size. Seventeen years on dragline, two on clamshell and one on crane. One year each on gasoline and Diesel machines. Can do own repair work. Will go anywhere in U. S. Age 36; married. A-1 references furnished. Located in Missouri. Box 8107.

DRAGLINE OPERATOR

Operator having 10 years' experience on Diesel dragline, on levee and canal construction desires position on Diesel machine of 3 to 8-yard capacity, preferably Bucyrus-Monighan dragline. Willing to go anywhere. Can do own repair work. A-1 references. Age 30; married. At present located in Nebraska. Box 8301

STEAM SHOVEL OPERATOR

Have 25 years' experience on steam machines on all kinds of construction work. Desire position on any make, size or type steam shovel; anywhere. Can do own repair work. Best references furnished. Age 50. Married. At present located in Missouri. Write Box 8105.

EXPERIENCED OPERATOR

Operator having 17 years' experience on all types of excavating machines desires position on drag shovel, dragline, Bucyrus-Erie or Northwest, gas or Diesel. Can handle any machine from one to 8 yards. Experience includes four years on steam machines, two years on electric, 8 years on gasoline, one year on Diesel and two years on Gas plus Air. Have two years experience on drag shovel on pipe line work. Willing to go anywhere in the U. S. A. Age 36; married. Can do own repair work and have best of references. Present location, Florida. Box 8401.

STEAM SHOVEL OPERATOR

Twenty years' experience on steam shovels on contracting and railroad work qualifies me to operate your steam engine. Age 44; married. References. Now located Southern Idaho. Box 8102.

OPERATOR

12 years' experience on steam shovels, locomotives, cranes, clamshells. Can do own repairing. Willing to go anywhere. 30 years old and single. First class references. Now located in New York. Box 8106.

SHOVEL OPERATOR

Operator—10 years' experience on shovel dragline and clamshell—on general excavation and mining—desires work on any make and type machine. Can do own repair work. Will go anywhere. Age 40; single. Best of references. Present location near Chicago. Box 8001.

DRAGLINE OPERATOR

Experienced crane and dragline operator wishes work preferably on Bucyrus dragline or piledriver. Has operated steam and gasoline machines for 15 years. Willing to go anywhere in U. S. Can do own repair work. Age 39; married. Good references. Located near Chicago. Box 8002.

EXCAVATING ENGINEER Bargain Counter

★ ★ ★ THE ITEMS LISTED on these pages have been selected because they offer unusual values to the man who is looking for a bargain. Some of this equipment is surplus stock which has never been used, some is rebuilt and carries new equipment guarantee, some is just plain used. But every item is priced for quick sale. If any of this equipment fits your needs send a postcard or letter, mentioning the reference number, to *Bargain Counter, Excavating Engineer, South Milwaukee, Wisconsin.* We'll pass your inquiry along to the owner and you will receive price and complete information promptly. Act now — with advancing prices on new stock this equipment will move fast.

COMPLETE FRONT END EQUIPMENT

Shovel Equipment

⅛ CU. YD. DIPPER, 16' boom, 13'8" dipper handle. Shovel equipment suitable for type "A" shovel. NEW. SE-30.

⅝ CU. YD. DIPPER, 12'6" dipper handle, 16' boom. Shovel equipment suitable for type "A" shovel. NEW. SE-31.

¾ CU. YD. DIPPER—23' BOOM—12'6" DIPPER HANDLE—Shovel Equipment suitable for 20-B Gas or Diesel. NEW. SE-15.

¾ CU. YD. DIPPER—25'9" BOOM—14' DIPPER HANDLE—Shovel Equipment suitable for 30-B Diesel. NEW. SE-17.

⅝ CU. YD. DIPPER—20'6" BOOM, 17' DIPPER HANDLE, high lift shovel equipment suitable for 20-B steam. NEW. SE-32.

⅞ CU. YD. DIPPER—21'9" BOOM and ENGINE — 15' DIPPER HANDLE — High Lift Shovel Equipment. Suitable for 31-B Steam. NEW. SE-18.

1 1 CU. YD. DIPPER—26' boom, 17' handle Shovel equipment—Will fit 30-B. SE-35.

1 1¾ CU. YD. DIPPER, 30' boom, 19' handle, high lift steam shovel equipment—Will fit 50-B. New. SE-33.

1 1¾ CU. YD. DIPPER, 22' boom, 16' handle, shovel equipment—Will fit 43-B. New. SE-34.

Skimmer Scoop

⅝ CU. YD. DIPPER—20' Boom together with all necessary ropes and material to completely convert Bucyrus-Erie 1020 Shovel, Clamshell or Dragline to Skimmer Scoop Machine. NEW. Shipment 2 to 3 weeks. SS-1.

Dragline Equipment

40' CHANNEL BOOM, FAIRLEAD AND ROPES, but not including bucket. For use on Model D-2—20-B—31-B. Used. DL-3.

BRAND NEW Ropes included with each of above Complete Equipments.

Trench Digging Equipment

1 CU. YD. 42½" WIDE—Solid type Dipper—24' Boom and all auxiliary equipment. Will dig maximum depth 22'. For application to GA-2 or GA-3 Shovel. Rebuilt—New Machine Guarantee. DS-5.

BRAND NEW PAGE, two dippers each ⅝ cu. yd., one 38" wide over cutters, the other 49½" wide over cutters. 17'1½" Boom and all necessary auxiliary equipment. Will fit Bucyrus-Erie 1030 or 1035. DS-7.

1-CU. YD. 42½" WIDE SOLID TYPE DIPPER—24' Boom and all auxiliary equipment—will dig maximum depth of 22'—For application to GA-2 or GA-3 Clamshell or Dragline. Rebuilt—New Machine Guarantee. DS-8.

BRAND NEW Ropes included with each of above Trench Digging Equipments.

DIPPER HANDLES

1 7'6" 1030 TUNNEL—Complete. New. H-1

1 7'10½" 20-B TUNNEL (two sticks). New. H-2.

1 9'0" 31-B TUNNEL (two sticks). New H-3.

3 9'0" 30-B TUNNEL (two sticks each). New. H-4.

1 9'6" 20-B TUNNEL (two sticks). New. H-5.

1 9'6" 31-B TUNNEL (two sticks). New. H-6.

1 12'0" 18-B—Complete. New. H-7.

1 12'6" D-2, 31-B—Complete. New. H-8.

1 12'6" D-2, 31-B—Complete. New. H-9.

1 13'0" 1020—Complete. New. H-10.

3 15'0" E-2 41-B—Complete. New. H-13.

1 16'0" TYPE "A"—Complete. New. H-16.

1 16'0"—43-B—Complete. New. H-17.

1 17'0"—TYPE "A"—Complete. New. H-18.

1 17'0"—20-B HIGH LIFT—Complete. New. H-19.

1 17'6"—37-B—Complete. Used. H-21.

1 19'6"—37-B—Complete. New. H-25.

BOOMS

1—15'0" 1030 CHAIN CROWD SHOVEL BOOM—Used. JA-32.

4—18' 20-B STEAM SHOVEL BOOM—New JA-2.

1—18' 31-B STEAM SHOVEL BOOM—New. JA-3.

1—20'0" 1020 ROPE CROWD SHOVEL BOOM—New. JA-23.

1—20'0" 1020 ROPE CROWD SHOVEL BOOM—New. JA-33.

1—20'0" 1030 CHAIN CROWD SHOVEL BOOM—New. JA-24.

2—20'6" 20-B STEAM SHOVEL BOOM—New. JA-4.

1—21'3" Type "B" Bar Boom—New. JA-37.

1—21'6" 37-B CHAIN CROWD SHOVEL BOOM—New. JA-26.

1—21'9" 31-B STEAM SHOVEL BOOM—New. JA-5.

2—22'0" 43-B CHAIN CROWD SHOVEL BOOM—Used. JA-27.

3—23' 20-B DIESEL, GAS OR ELECTRIC SHOVEL BOOM—New. JA-7.

1—23'6" 37-B ROPE CROWD SHOVEL BOOM—New. JA-28.

1—24'0" 43-B ROPE CROWD SHOVEL BOOM—New. JA-29.

1—24'0" GA-2 DRAG SHOVEL BOOM—New. JA-30.

1—24'0" GA-2 DRAG SHOVEL BOOM—Used. JA-34.

1—24'0 GA-3 DRAG SHOVEL BOOM—New. JA-35.

1—24' GA-2 or GA-3 SHOVEL BOOM—New. JA-8.

2—24' 43-B ROPE CROWD SHOVEL BOOM—New. JA-9.

1—25'0" 37-B ROPE CROWD SHOVEL BOOM—Used. JA-36.

1—25'9" 30-B DIESEL SHOVEL BOOM—New. JA-10.

1—26' 20-B DIESEL SHOVEL—New. JA-11.

2—26' D-2 SHOVEL BOOM—New. JA-13.

1—26' 50-B STEAM SHOVEL BOOM—New. JA-15.

3—27' 43-B ROPE CROWD SHOVEL BOOM—New. JA-16.

1—27'9" 43-B ROPE CROWD SHOVEL BOOM—New. JA-31.

1—30' 50-B ELECTRIC SHOVEL BOOM—New. JA-17.

3—30' 50-B STEAM SHOVEL BOOM—New. JA-18.

1—40' 20-B, 31-B and D-2 DRAGLINE BOOM—Used. JA-20.

DIPPERS

Small Machines

3 ½ CU. YD.—Plate Front—Will fit 1020 Drag Shovel. New. D-45.

3 ⅝ CU. YD.—Plate Front—Will fit 20-B. New. D-12.

1 2/3 CU. YD.—Plate Front—Will fit 14-B. New. D-13.

1 ¾ CU. YD.—Rock Type—Will fit 20-B New. D-67.

1 ⅞ CU. YD.—Ins. Tooth—Will fit 1030. New. D-47.

1 1 CU. YD.—Plate Front—Will fit 20-B. New. D-42.

1 1 CU. YD.—Rock Type—Will fit 1030 Tunnel Shovel. New. D-50.

2 1¼ CU. YD.—Ins. Tooth—Will fit 30-B, 41-B, 42-B, E-2. New. D-44.

1 1¼ CU. YD.—Rock Type—Will fit 30-B, 41-B, 42-B, E-2. Used. D-27.

1 1¼ CU. YD. — Ins. Tooth — Will fit 37-B. Used. D-52.

1 1½ CU. YD. — Ins. Tooth — Will fit 37-B. Used. D-38.

1 1⅝ CU. YD.—Ins. Tooth—Will fit 42-B, 43-B. New. D-55.

1 1½ CU. YD.—Ins. Tooth—Will fit 43-B. Used. D-39.

3 1¾ CU. YD.—Ins. Tooth—Will fit 43-B. New. D-58.

1 1 CU. YD. PLATE FRONT—Will fit 30-B, 41-B, 42-B, E-2. New. D-65.

Large Machines

1 2 CU. YD.—Manganese—Will fit 43-B. New. D-62.

1 3 CU. YD.—2½" Molybdenum cast steel front, two part Van Port reversible teeth—Will fit 100-B, 68-C, 70-C. New. D-2.

1 3½ CU. YD.—2¾" nickel chrome steel front. two part Van Port reversible teeth—Will fit 88-C, 95-C, Class 80 Atlantic. New. D-3.

1 4 CU. YD.—2¾" Molybdenum cast steel front, two part reversible teeth. In good condition.—Will fit 100-C, 120-B. Used. D-4.

1 6 CU. YD.—Molybdenum steel front. Annealed cast steel back, two-part Reversible Van Port Teeth.—Will fit 200-B, 225-B and 320-B. New. D-11.

1 8 CU. YD.—Front Molydenum steel, two part Van Port Reversible teeth. Slightly used but excellent condition.—Will fit 320-B. Used. D-6.

DIPPER TRIPS

1—30-B STEAM DIPPER TRIP—New. DT-1.

1—31-B STEAM DIPPER TRIP—New. DT-2.

4—50-B STEAM DIPPER TRIPS—New DT-4.

BUCKETS

Dragline

3 2 CU. YD.—PAGE CLASS "C". 5630 lbs. New. DB-4.

1 2 CU. YD.—BECO TYPE "U". 3650 lbs. Rebuilt. DB-12.

1 2 CU. YD.—BECO TYPE "X". 5300 lbs. New. DB-23.

2 2 CU. YD.—BECO HEAVY DUTY. 5400 lbs. New. DB-24.

3 2¼ CU. YD.—BECO TYPE "U". 3850 lbs. New. DB-13.

1 2½ CU. YD.—BECO TYPE "U". 4100 lbs. New. DB-14.

1 2½ CU. YD.—BECO HEAVY DUTY. 6500 lbs. Rebuilt. DB-9.

1 2½ CU. YD.—OMAHA—STD. 5400 lbs. Rebuilt. DB-10.

1 5 CU. YD.—MONIGHAN HEAVY DUTY. 12000 lbs. New. DB-16.

1 6 CU. YD.—MONIGHAN TYPE "W". 12500 lbs. New. DB-17.

1 7 CU. YD.—MONIGHAN TYPE "W". 1370 lbs. New DB-18.

Clamshell

1 2 CU. YD. TYPE PF WILLIAMS CLAM-SHELL BUCKET without teeth and counter-weight. CSB-1.

ELECTRICAL EQUIPMENT

90 H.P. MOTOR — GENERAL ELECTRIC — 3 phase, 25 cycle, 550 volt, 1500 RPM. NEW. EE-1.

5 KVA TRANSFORMER—GENERAL ELECTRIC—2200-3810 volt primary, 440-220 volt secondary—3 phase, 60 cycle, with cast iron tank and cover, including specially fastened bushings to prevent oil leakage. NEW. EE-4.

TANKS

Water

5—260 GALLON 41⅞"x21"x6'4". No. 14 BW gauge steel plate. T-1.

2—200 GALLON 36½"x20 1/16"x6'3" high. Elliptical—¼" steel plates. T-2.

1—283 GALLON 54⅜"x17⅜"x6'4". ¼" Steel plates. T-3.

Oil

4—60 GALLON 11½"x18"x77" Elliptical Blue annealed copper alloy smooth plate. T-4.

6—25 GALLON 47¼" dia. 14" deep—12 Gauge Std. Blue annealed copper alloy steel. T-5.

1—294 GALLON 48"x21¼"x6'4". ¼" steel plates. T-6.

4—50 GALLON 60" dia. x 12" deep—No. 12 Gauge Std. blue annealed copper alloy. T-7.

Gasoline

1—44 GALLON 18" dia. 43" high—No. 14 Gauge U. S. Std. welded construction. T-8.

6—55 GALLON 30"x18½"x23½" 16 Gauge—U.S.S. Terne metal. (1 copper brazed and 5 soldered) T-9.

Air

2—5 CU FT.—16" dia. x 48" high—225 lb. working pressure A.S.M.E. Std. Tested to 340 lb. cold water test. T-10.

1—14 CU. FT.—21½" dia. x 77" high—200 lb. working pressure. Will pass inspection in Massachusetts and any Canadian Province. T-12.

2 16 CU. FT—22⅝" dia. 77" high—200 lb. working pressure A.S.M.E. Std. T-13.

ENGINES

Designed especially for application to Excavating or similar Equipment. Can be used for stationary or semi-stationary service.

Diesel

2—140 H.P. NEW, NON-REVERSIBLE ATLAS DIESEL ENGINES—6 cylinder, 9" bore x 10½" stroke, 514 R.P.M., 4 cycle, vertical overhead valves, dust proof, oil tight crank case and forced lubrication. Includes auxiliary air starting equipment. DE-2.

Steam

1 12½"x16" link reversing type for Railroad Shovel. ME-1.

2 4½"x5" reversible—20.8 H.P. at 400 R.P.M. 100 lb. Pressure. ME-2.

1 4¾"x5" reversible—23.2 H.P. at 400 R.P.M. 100 lb. Pressure. ME-3.

1 5"x5" reversible—25.6 H.P. at 400 R.P.M. 100 lb. Pressure. ME-4.

BOILERS

NEW

Will Make That Old Shovel Work Like New.

Can also be used for Miscellaneous Service

Vertical Type

1 46½"x110"—32 H.P.—155 lb. Working Pressure. Special Wood Burning Fire Box. ASME Std. Will fit any B-2 or B-3. B-9.

Locomotive Type

2 44"x17'—75 H.P. 125 lb. Working Pressure. ASME Std. Will fit Model 68-C. B-18.

AIR COMPRESSORS

1 BRAND NEW WORTHINGTON—METAL-WELD—2-cylinder 7"x6" Vertical 162 cu. ft. piston displacement, Air Compressor. Fitted with Laidlaw feather valves—Lugs on side for mounting on skids or channels—Shaft extended and equipped with semi-flexible coupling to take 2⅝" drive shaft—Force feed lubrication. Automatic control. Includes 1" High capacity centrifugal circulating pump—"V" belt driven—18"x41" Air Receiver, 100 pounds working pressure, A.S.M.E. Standard. Electric or gasoline power required approximately 30 H.P., approximately 1000 R.P.M.—Compressor Speed approximately 550 R.P.M.—Overall dimensions: Height 45"—length 37½"—width 28". AC-3.

2 11"x11"x12" STEAM DRIVEN LOCOMOTIVE TYPE, Westinghouse air compressors with fittings. NEW. AC-1.

1 11"x11"x12" STEAM DRIVEN LOCOMOTIVE TYPE, Westinghouse air compressors with fittings. Used. Make offer. AC-2.

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SMALL SHOVELS
Under 2 Yards

¾-YARD

BAY CITY—¾ YARD GASOLINE SHOVEL AND TRENCH HOE. Located Connecticut. Bargain price. Box 908-SS

BUCYRUS-ERIE 10-B GASOLINE SHOVEL. 14" cat treads. Hercules engine. Excellent condition. Located North Carolina. Box 907-SS

BUCYRUS-ERIE 10-B DIESEL DRAGLINE, 25 foot boom, long cat. Long side frames—20" treads. ⅜ yard AU drag bucket. Buda four cylinder 3⅝"x4½" Diesel engine with Excello fuel pump and fuel supply pump with filter. Kohler 800 watt light plant. Used as demonstrator. New machine guarantee. Located New York. Box 861-SS.

INSLEY — TYPE C — GASOLINE SHOVEL. Engine recently rebored and reconditioned. Machine generally in good operating and mechanical condition. Equipped with Buda type KTU Diesel engine. Located Arkansas. Box 814-SS.

INSLEY Type C Combination Shovel and Skimmer Scoop. Buda 4-cylinder 4"x5½" Type KTU Engine. Field reconditioned. Excellent condition. Located Georgia. Box 834-SS.

INSLEY COMBINATION GASOLINE SHOVEL AND DRAGSHOVEL—⅜ cubic yard. Located Massachusetts. Box 847-SS.

UNIVERSAL-UNIT ¾-swing combination ⅜ cu. yd. gasoline shovel and 30-foot boom dragline, including ⅜ cu. yd. dragline bucket. Working every day. Good condition. Located Grand Haven, Michigan. Box 769-SS.

½-YARD

BAY CITY MODEL K-2 half yard gas shovel. Box 862-SS.

BROWNHOIST MODEL NO. 2 ½ cu. yd. rope crowd gasoline shovel or clamshell. Waukesha four cylinder engine in good operating condition. Bargain price. Located near Peoria, Illinois. Box 689-SS.

BUCYRUS-ERIE 16-B GAS SHOVEL, CLAMSHELL AND DRAGLINE. 16'6" Shovel Boom, 12'6" Dipper Handle, ⅝ cu. yd. Dipper. 35' Clamshell and Dragline Boom—including Blaw-Knox ½ yard No. 665 Clam Bucket and ½ yard B-E AX Drag Bucket. Waukesha 6-cylinder 3¾"x4¾" Gasoline Engine. Electric Starter. Practically new—used only about 10 days as shovel and 50 days as clamshell-dragline. Price right. Located western Pennsylvania. Box 918-SS.

P & H MODEL 300-A DIESEL SHOVEL and clamshell 18' boom—13' dipper handle—⅝ yard dipper—17" cat treads. 35' plus 5' extension clamshell boom. No bucket. Cat Diesel three cylinder D-6100 engine. Located Northern Florida. Box 863-SS.

SPEEDER B-2 ½ YARD GAS SHOVEL. 16' Boom. 12' dipper handle. ½ yard plate dipper. 16" cat treads. Weight 29,200 lbs. Hercules 4 cylinder gasoline engine. Good operating condition and appearance. Few minor repairs needed. Located Albuquerque, New Mexico. Box 910-SS

THEW TYPE S electric mining crawler shovel, ½-yard bucket, 20 h.p. and 12 h.p. Otis motors. Located in Minnesota. Box 832-SS.

⅝-YARD

P&H MODEL 204 GAS SHOVEL, 19' Shovel Boom, 16' Dipper Handle, ⅝ yard Dipper. Good mechanical condition. Located Chicago. Box 919-SS.

P&H MODEL 300 SHOVEL—18' Boom, 15' Dipper Handle, ⅝ cubic yard Dipper, manganese front. Powered with Waukesha B U 4½"x6¼" engine, power clutch control. First class operating condition. Located Massachusetts. Box 663-SS.

¾-YARD

BUCYRUS-ERIE TYPE B STEAM COMBINATION SHOVEL-CLAMSHELL AND STEAM HOE. Machine completely rebuilt 1929. Good operating condition. Located near Boston. Box 517-SS.

BUCYRUS-ERIE—TYPE B—Combination shovel and 40' boom crane. Boiler reflued and the machine in fair operating condition. Located Arkansas. Box 815-SS.

BUCYRUS-ERIE TYPE B HIGH LIFT STEAM SHOVEL. Caterpillar mounted. Good operating condition. Located New Haven, Connecticut. Box 776-SS.

BUCYRUS-ERIE TYPE B CATERPILLAR MOUNTED, HIGH LIFT STEAM SHOVEL. Good operating condition. Located Connecticut. Box 775-SS.

BUCYRUS-ERIE TYPE B STEAM SHOVEL, Cat. mounted, equipped with 19'6" boom 16' dipper stick and ¾ yard dipper including 36' clamshell boom in good working order. Located near Hudson, Pennsylvania. Price $1000.00. Box 493-SS.

BUCYRUS-ERIE TYPE B STEAM SHOVEL, Cat. mounted, 19'6" boom, 14' dipper handle, ¾ cubic yard dipper, also 36' clamshell boom and front drum and gearing. Located Kansas City, Missouri. Box 622-SS.

BUCYRUS-ERIE 20-B COMBINATION STEAM SHOVEL - CLAMSHELL - DRAGLINE. Good working condition. Caterpillar Mounted. Located near Racine, Wis. Box 701-SS.

BUCYRUS-ERIE TYPE B STANDARD ¾ YARD STEAM SHOVEL—Quarry type Dipper — Caterpillar mounted. Good operating condition. Located Georgia. Box 752-SS.

TYPE B BUCYRUS-ERIE HIGH LIFT STEAM SHOVEL 21'3" Boom, 18'4" Dipper Handle. ¾ cubic yard inserted Tooth Dipper—Power Boom Hoist — Boiler Feed Pump — Caterpillar Mounted. Located Chicago. Box 699-SS.

BUCYRUS-ERIE 1030 GAS SHOVEL. 20'6" Boom, 13'6" Dipper Handle, ⅞ yard Cast Front Inserted Tooth Dipper. Good condition. Located Minnesota. Box 920-SS.

BUCYRUS-ERIE 1030 GAS SHOVEL AND CLAMSHELL. 23' shovel boom, 15' dipper handle—¾ yard dipper. Rope crowd. 40' clamshell boom. No bucket. Wisconsin B-3 gas engine. Located Kentucky. Available about August 1. Box 864-SS.

BUCYRUS-ERIE TYPE B high lift steam shovel and 40' clamshell boom including front drum and gearing. Good working condition. Located Eastern Pennsylvania. Low price. Box 865-SS.

KOEHRING MODEL 301 ¾ yard gas shovel. Wisconsin 5"x6" engine. Good working condition. Located Louisville, Kentucky. Box 866-SS.

MARION MODEL 21 ELECTRIC—M.G. SET ¾ YARD SHOVEL. Good condition. Located eastern Pennsylvania. Box 725-SS.

NORTHWEST MODEL 3 GASOLINE CABLE CROWD—FEATHER TOUCH CONTROL—SHOVEL. Good operating condition. Located Chicago. Box 798-SS.

NORTHWEST MODEL 3 GAS SHOVEL, 22'6" Boom, 16'4" Dipper Handle, ¾ yard Dipper. Wisconsin B-3 4-cylinder 5½"x6½" Engine. Has seen very little service. Must be seen to be appreciated. Excellent condition. Located New York. Box 921-SS.

OSGOOD MODEL 18 Steam—¾ yard shovel— Cat mounted. Just completely overhauled. Excellent condition. Located near Indianapolis, Ind. Box 522-SS.

OSGOOD AIR TUNNEL SHOVEL. 13' boom, 8' dipper handle—¾ yard dipper. Located Western New York State. Box 867-SS.

P&H MODEL 400 GAS SHOVEL AND DRAGLINE. 21' Shovel Boom, 14'3" Dipper Handle, ¾ yard Dipper. 40' Dragline Boom and Bucket. Waukesha GU 4-cylinder 5⅜"x6¼" Engine. Good working condition. Located northern Illinois. Box 922-SS.

⅞-YARD

MARION MODEL 21 — ⅞ CUBIC YARD STEAM SHOVEL. Caterpillar Mounted. Good working condition. Located Georgia. Box 758-SS.

BUCYRUS-ERIE B-2 HIGH LIFT STEAM SHOVEL. 21'3" Boom—16' Dipper Handle—⅞ cu. yd. inserted tooth Dipper. Good operating condition. Located Boston, Mass. Box 853-SS.

BUCYRUS-ERIE B-2 HIGH LIFT STEAM SHOVEL. 19'9" Boom— 16' Dipper Handle—⅞ cu. yd. Dipper. Located near Boston, Mass. Box 854-SS.

1-YARD

BUCYRUS-ERIE 1030 ELECTRIC TUNNEL SHOVEL. 10'7" Boom, 10'5" Dipper Handle, 1¼ yard Dipper. Equipped for power supply of 3 Phase, 60 Cycle, 440 Volt. Excellent condition. Located West Virginia. Box 923-SS.

BUCYRUS-ERIE LATE MODEL B-2 STEAM HIGH LIFT SHOVEL. 1 yard dipper—single shaft cat mounting. Good condition. Located near St. Louis. Box 518-SS.

BUCYRUS-ERIE B-2 AIR TUNNEL SHOVEL. 14'6" boom, 10'9" dipper handle—⅞ yard dipper. Located Ohio. Box 869-SS.

BUCYRUS-ERIE GA-2 GAS-AIR SHOVEL. 22'6" boom—16' dipper handle—one yard dipper. Waukesha four cylinder 5¾"x8" engine. Overhauled approximately one year ago. Good operating condition. Located Knoxville, Tennessee. Box 870-SS.

BUCYRUS-ERIE GA-2 GAS-AIR SHOVEL. 22'6" boom—16' dipper handle—one yard dipper. Electric starter. Waukesha four cylinder 5¾"x8" gas engine. Located Louisville, Kentucky. Box 871-SS.

BUCYRUS-ERIE GA-2 GAS-AIR HIGHLIFT SHOVEL, 24' boom—16' dipper handle—one yard dipper. Single shaft cat. Electric starter. Waukesha 5¾"x8" four cylinder engine. Good operating condition. Located Boston. Box 875-SS.

BUCYRUS-ERIE GA-2 1-yard dipper. Mounted on caterpillars. Located in Minnesota. Box 831-SS.

BUCYRUS-ERIE 30-B STEAM SHOVEL. Located St. Louis, Missouri. Box 817-SS.

BUCYRUS-ERIE GA-2 — Gas-Air Combination High Lift Shovel and 50' Boom Dragline Equipment, mounted on Single Shaft Cat. Good operating condition. Located at Fort Smith, Ark. Box 537-SS.

BUCYRUS-ERIE MODEL B-2 High Lift Steam Shovel. Caterpillar mounted. Very good working condition. Located South Carolina. Box 644-SS.

BUCYRUS-ERIE GA-2 COMBINATION SHOVEL AND DRAGLINE. 22'6" Shovel Boom, 16' Dipper Handle, 1 cubic yard cast front inserted tooth Dipper. 50' Dragline Boom including Fair leads but not Bucket. Air Starter. Good condition. Located Newark. Box 718-SS.

FOR SALE

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

BUCYRUS-ERIE GA-2 HIGH LIFT SHOVEL. 24' Boom—18'4" Dipper Handle, 1 cubic yard Inserted Tooth Dipper. Also includes Forward Drum and Gearing and mechanism for clamshell operation including 45' boom. Also 1 cubic yard Williams clamshell bucket. Waukesha WL Engine. Good operating condition. Located Chicago. Box 702-SS.

BUCYRUS-ERIE MODEL B-2 High Lift Steam Shovel and 50' Boom Clamshell Equipment. Caterpillar mounted. Good working condition. Located northern New Jersey. Price very reasonable. Box 643-SS.

LORAIN-THEW — A-1 — 1 YARD STEAM SHOVEL. 21' Boom. 15' Dipper handle. 1 yard dipper. Center drive cat. Located Toledo, Ohio. Box 912-SS

MARION MODEL 7 ONE-YARD STEAM SHOVEL, equipped with Model 450 boiler. Located Scranton, Pennsylvania. Box 873-SS.

MARION 1 CUBIC YARD STEAM SHOVEL. Bargain Price. Box 777-SS.

P & H MODEL 600 ONE YARD GAS SHOVEL. Just recently overhauled. Excellent condition. Located eastern Pennsylvania. Box 855-SS.

P & H MODEL 600—1 yd. Gasoline Shovel— including 40' boom dragline equipment without bucket. Waukesha Engine. Recently overhauled. Located in Alabama. Box 483-SS.

P&H—MODEL 600—Combination 1 yard shovel and 40' boom dragline including dragline bucket. Waukesha gasoline engine. Machine in fair operating condition. Located Georgia. Box 695-SS.

P & H MODEL 600 GAS SHOVEL AND CLAMSHELL, 19'3" boom—14'3" dipper handle one yard dipper—40' clamshell boom—1½ yard rehandling clamshell bucket. Rebuilt 1933. Excellent condition. Located Kentucky. Box 874-SS.

1¼-YARD

BUCYRUS-ERIE GA-2 HIGH LIFT SHOVEL. 22'-6" Boom. 14' dipper handle. 1¼ yard inserted tooth dipper. Steel cab. Electric starter. Waukesha WL-4 cylinder 6¼"x8" gas engine. Excellent condition. Located Texas. Box 913-SS

BUCYRUS-ERIE GAS-AIR TYPE GA-2 HIGH LIFT SHOVEL — 22'6" boom — 16' dipper handle—1¼ yard cast front inserted tooth dipper—single shaft caterpillar mounting—electric starter. Excellent condition. Field reconditioned. Waukesha 4-cylinder 6¼"x8" engine — New cylinder blocks and piston rings. Located near Scranton, Pennsylvania. Will demonstrate. Box 508-SS.

BUCYRUS-ERIE GA-2 GAS-AIR SHOVEL. 22'6" boom—16' dipper handle—1¼ yard dipper. Electric starter. Single shaft cat. Very good condition. Located New Hampshire. Box 880-SS.

BUCYRUS-ERIE GA-2 GAS-AIR HIGHLIFT SHOVEL, 22'6" boom—16' dipper handle 1¼ yard dipper. Single shaft cat. Wisconsin D-2 gas engine—suitable 4000' altitude. Located Texas. Box 881-SS.

BUCYRUS-ERIE GA-3 GAS-AIR HIGHLIFT SHOVEL, 22'6" boom—16' dipper handle 1¼ yard dipper. Single shaft cat. D-2 Wisconsin gas engine. Very good condition. Located New Mexico. Box 882-SS.

BUCYRUS-ERIE GA-3 GAS-AIR HIGHLIFT SHOVEL AND CLAMSHELL, 22'6" shovel boom—16' dipper handle—1¼ yard dipper—50' clamshell boom and equipment. Electric starter. Steel cab. D-2 Wisconsin six cylinder 5¼"x6½" gas engine. Box 884-SS.

BUCYRUS-ERIE 34-B GAS SHOVEL, 20' boom —16' dipper handle 1¼ yard dipper. Electric starter. Wisconsin six cylinder 5½x6½ engine only used about six months. Excellent condition. Located Connecticut. Box 885-SS.

BUCYRUS-ERIE 41-B STEAM SHOVEL. 21' boom—15' dipper handle—1¼ yard inserted tooth dipper—dipper trip. Boiler lagged. Located New York. Box 896-SS.

BUCYRUS-ERIE 41-B STEAM SHOVEL-CLAMSHELL-PILE DRIVER. 21' shovel boom 15' dipper handle—1¼ yard rock dipper 45' boom clamshell equipment—pile driving leads. Good operating condition. Available about November 1. Located New York. Box 897-SS.

BUCYRUS-ERIE 37-B Gasoline Shovel. 23' Boom 17' Dipper handle. 1¼ cubic yard dipper. Chain Crowd. Wisconsin D-3 6-cylinder 5½"x6½" Engine. Reconditioned. Excellent condition. Located Vicinity of New York. Box 840-SS.

BYERS-MASTER 1¼ YARD GAS SHOVEL. Hercules four cylinder engine. Good operating condition. Located Eastern Pennsylvania. Box 898-SS.

KOEHRING MODEL 501 1¼ yard gas shovel. Field reconditioned. Available about August 15. Located New Mexico. Box 879-SS.

LIMA MODEL 101 GAS SHOVEL—21' boom 17' dipper handle—1¼ yard dipper. Located Eastern Pennsylvania. Box 886-SS.

LORAIN 75-A 1¼ YARD GAS SHOVEL. Reported good condition—will sell on terms. Located Memphis, Tennessee. Box 887-SS.

LINK-BELT MODEL K-42 1¼ YARD GASOLINE SHOVEL. Waukesha Model WL 6¼"x 8" 4-cylinder Engine—new blocks and pistons this year. Good working condition. Located Colorado. Box 738-SS.

LORAIN MODEL 75—1¼ YD. SHOVEL. 21'0" boom, 14' dipper handle. Engine—Waukesha WL 6-cylinder 6¼"x8" gasoline. Located—Denver, Colorado. Box 806-SS.

MARION MODEL 450 ELECTRIC SHOVEL AND DRAGLINE. 23' Shovel boom. 16½' dipper handle with new racking. 1¼ yard dipper. 45' dragline boom and machinery included. ¾ yard drag bucket. Suitable for power supply 3 phase, 60 cycle, 2300 volts. Excellent condition throughout. Located near Chicago. Box 914-SS

MARION TYPE 32 STEAMER. Shop No. 5676, 18' boom, 15' dipper handle, 1¼-cu. yd. dipper shipped May, 1926, good operating condition. Box 451-SS.

MARION MODEL 450 1¼ DIESEL SHOVEL. Located Eastern Pennsylvania. Box 889-SS.

MARION MODEL 450 ELECTRIC SHOVEL. 1¼ yard AC-DC 3 phase, 60 cycles, 440 volts. Located Eastern Pennsylvania. Box 890-SS.

P & H MODEL 650 SHOVEL. 23' boom—16' dipper handle—1¼ yard dipper. Electric starter. Split second control. Waukesha four cylinder 6¼"x8" engine. Machine shop rebuilt. Located Milwaukee. Box 878-SS.

1½-YARD

BUCYRUS-ERIE 43-B GASOLINE CHAIN CROWD SHOVEL — 23' boom — 17' dipper handle—1½ cubic yard Vanderhoef dipper and teeth—electric starter—standard single shaft cat. Operated less than six months. Excellent appearance and condition. Will be demonstrated by owner. Located vicinity New York. No. 512-SS.

BUCYRUS-ERIE E-2 DIESEL SHOVEL. 26' boom 15' dipper handle—1½ yard dipper. Good repair and operating condition. Located Boston. Box 891-SS.

BUCYRUS-ERIE E-2 DIESEL SHOVEL AND DRAGLINE. 27' shovel boom 15' dipper handle—1½ yard dipper—50' dragline boom and equipment—no bucket—Kohler light plant. Atlas four cylinder 7½"x10½" engine. Box 892-SS.

BUCYRUS-ERIE 43-B GAS SHOVEL AND DRAGLINE. 23' shovel boom—17' dipper handle—1½ yard dipper 50' boom dragline equipment. No bucket. Electric starter. Wisconsin Model E-six cylinder 6"x7" gas engine. Excellent condition. Located Eastern Pennsylvania. Box 893-SS.

TWO LORAIN 75-B COMBINATION 1½ CUBIC YARD SHOVEL AND 50' BOOM DRAGLINES — without buckets. Gasoline power. Good working condition. Located eastern Pennsylvania. Box 721-SS.

LORAIN MODEL 75 GAS SHOVEL. 20'6" Boom, 16' Dipper Handle, 1½ yard Dipper. Also Shovel Equipment available for tunnel operation consisting of 15' Boom, 12' Dipper Handle and 1½ yard Dipper. Good operating condition. Located New York. Box 924-SS.

OSGOOD "VICTOR" 1½ CUBIC YARD SHOVEL AND 50' BOOM CLAMSHELL MACHINE. Gasoline Power. Good operating condition. Located Minneapolis. Box 760-SS.

P & H MODEL 700—1½ CU. YD. GASOLINE SHOVEL. Engine: Waukesha 4-cyl. 7½"x8" Engine. Fair working condition. Located New Mexico. Bargain price. Box 789-SS.

1¾-YARD

BUCYRUS-ERIE 43-B GAS CHAIN CROWD SHOVEL AND CLAMSHELL. 22' Boom, 16' Dipper Handle, 1¾ yard Dipper. 50' Clamshell Boom. No Bucket. Electric Starter. Single Shaft Cat. Wisconsin E-6-cylinder 6"x7" Engine. Excellent condition. Located New York. Box 925-SS.

5—MARION MODEL 37, 1¾ yard steam shovels, steel cab. Good working condition. Located Minnesota. Box 825-SS.

SMALL DRAGLINES
Under 2 Yards

⅜-YARD

⅜-YARD SARGENT SCOUT DRAGLINE. Powered with McCormick-Deering Model 200 4-cylinder 4¼x5 heavy duty gas engine. Cable speed 160 fpm, single line. Two traveling speeds. Capacity as crane from 8000 lbs. at 8 ft. radius to 2800 lbs. at 24 ft. radius. Iowa. Box 772-SD.

UNIVERSAL-UNIT ¾ swing combination 30-foot boom gasoline dragline and ⅜ cu. yd. shovel. ⅜ cu. yd. dragline bucket. Working every day. Good condition. Located Grand Haven, Michigan. Box 769-SD.

½-YARD

BUCYRUS-ERIE 16-B GAS DRAGLINE, CLAMSHELL AND SHOVEL. 16'6" Shovel Boom, 12'6" Dipper Handle, ⅝ cu. yd. Dipper. 35' Clamshell and Dragline Boom—including Blaw-Knox ½ yard No. 665 Clam Bucket and ½ yard B-E AX Drag Bucket. Waukesha 6-cylinder 3⅜"x4¾" Gasoline Engine. Electric Starter. Practically new—used only about 10 days as shovel and 50 days as clamshell-dragline. Price right. Located western Pennsylvania. Box 918-SD.

BUCYRUS-ERIE — 1020 GASOLINE DRAGLINE—CLAMSHELL—35' Boom. No buckets. Electric starter. Lighting equipment. Waukesha 4 cylinder 4¾"x6¼" engine. Good condition. Located Chicago. Box 909-SD

¾-YARD

BUCYRUS-ERIE 20-B COMBINATION STEAM DRAGLINE - CLAMSHELL - SHOVEL. Good working condition. Caterpillar Mounted. Located near Racine, Wis. Box 701-SD.

LORAIN GAS DRAGLINE—CLAMSHELL. 40' Boom. ¾ yard capacity. Good condition. Box 911-SD

P&H MODEL 400 GAS DRAGLINE AND SHOVEL. 21' Shovel Boom, 14'3" Dipper Handle, ¾ yard Dipper. 40' Dragline Boom and Bucket. Waukesha GU 4-cylinder 5¾"x-6¼" Engine. Good working condition. Located northern Illinois. Box 922-SD.

1-YARD

BUCYRUS-ERIE DA-2 DIESEL-AIR 40' BOOM DRAGLINE. No bucket. Atlas Diesel engine. Located Eastern Pennsylvania. Box 872-SD.

BUCYRUS-ERIE D-2 DIESEL DRAGLINE including 1¼ yd. Page RS drag bucket. Located Texas. Box 868-SD.

FOR SALE

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

SMALL DRAGLINES
Under 2 Yards
continued

BUCYRUS-ERIE GA-2 COMBINATION DRAGLINE AND SHOVEL. 50' Dragline Boom including Fairlead but not Bucket. 22'6" Shovel Boom, 16' Dipper Handle, 1 cubic yard cast front inserted tooth Dipper. Air starter. Good condition. Located Newark.
Box 718-SD.

LINK-BELT 1 CUBIC YARD CAPACITY 50' BOOM DRAGLINE WITHOUT BUCKET. Gasoline power. Reported good operating condition. Located near Chicago. Box 724-SD.

P&H—MODEL 600—Combination 40' boom dragline and 1 yard shovel including dragline bucket. Waukesha gasoline engine. Machine in fair operating condition. Located Georgia.
Box 695-SD.

1¼-YARD

BUCYRUS-ERIE 34-B DIESEL DRAGLINE. 45' boom—Atlas six cylinder 6½"x8" engine. Standard single shaft cat. No bucket. Used approximately one year. Field reconditioned. Located San Francisco. Available about Sept. 1.
Box 877-SD.

LORAIN 75 GAS—50' BOOM DRAGLINE. No bucket. Waukesha four cylinder 6¾"x8" engine. Reported excellent condition. Located Eastern Pennsylvania. Box 888-SD.

MARION MODEL 450 ELECTRIC DRAGLINE AND SHOVEL 23' Shovel boom. 16½' dipper handle with new racking. 1¼ yard dipper. 45' dragline boom and machinery included. ¾ yard drag bucket. Suitable for power supply 3 phase, 60 cycle, 2300 volts. Excellent condition throughout. Located near Chicago.
Box 914-SD

1½-YARD

2 LORAIN 75-B COMBINATION DRAGLINES AND SHOVELS. 50' dragline booms without buckets. 1½ cubic yard shovel equipment. Gasoline power. Good working condition. Located eastern Pennsylvania. Box 721-SD.

TWO P&H 700 DRAGLINES. 1½ cu. yd. buckets on 50' booms. Gas and Diesel. Located Lower Rio Grande Valley, Texas.
Box 618-SD.

SMALL CLAMSHELLS AND CRANES
Under 2 Yards

⅝-YARD

BAY CITY "PUP" CLAMSHELL MACHINE. Good operating condition. Box 514-SCC.

½-YARD

BUCYRUS-ERIE 16-B GAS CLAMSHELL, DRAGLINE AND SHOVEL. 16'6" Shovel Boom, 12'6" Dipper Handle, ⅝ cu. yd. Dipper. 35' Clamshell and Dragline Boom—including Blaw-Knox ½ yard No. 665 Clam Bucket and ½ yard B-E AX Drag Bucket. Waukesha 6-cylinder 3¾"x4¾" Gasoline Engine. Electric Starter. Practically new—used only about 10 days as shovel and 50 days as clamshell-dragline. Price right. Located western Pennsylvania.
Box 918-SCC.

BUCYRUS-ERIE — 1020 GASOLINE CLAMSHELL—DRAGLINE—35' Boom. No buckets. Electric starter. Lighting equipment. Waukesha 4 cylinder 4¾"x6¼" engine. Good condition. Located Chicago. Box 909-SCC

BYERS BEARCAT CLAMSHELL—Crane—30' boom. Will handle ½ cubic yard bucket. Located near Grand Rapids, Mich. Box 648-SCC.

ORTON 24' BOOM—½ CUBIC YARD CLAMSHELL MACHINE. ½ cubic yard Owen Clamshell Bucket. Hercules 55 HP. Gasoline Engine. Factory rebuilt 1932. Good operating condition. Located Tennessee.
Box 709-SCC.

¾-YARD

BUCYRUS-ERIE 20-B COMBINATION STEAM CLAMSHELL—DRAGLINE—SHOVEL. Good working condition. Caterpillar Mounted. Located near Racine, Wis. Box 701-SCC.

LORAIN GAS CLAMSHELL—DRAGLINE. 40' Boom. ¾ yard capacity. Good condition.
Box 911-SCC

O & S MODEL "T" ¾ yard clamshell machine. 40' boom. Good working condition. Powered with Climax 5½"x7" gasoline engine. Located near St. Louis. Good working condition.
Box 651-SCC.

1-YARD

BUCYRUS-ERIE GA-2—45' BOOM CRANE. Waukesha gas engine. First class operating condition. Located Tennessee. Box 816-SCC.

1¼-YARD

1¼ YD. OSGOOD MODEL 2498 GAS, 40' boom. Clamshell equipment including bucket. Excellent operating condition. Favorable price. Located Springfield, Ohio.
Box 859-SCC.

NORTHWEST MODEL 105 Gasoline—40' boom clamshell. Good operating condition. Located Iowa. Box 516-SCC.

1½-YARD

OSGOOD "VICTOR" 50' BOOM CLAMSHELL MACHINE AND 1½ CUBIC YARD SHOVEL. Gasoline Power. Good operating condition. Located Minneapolis. Box 760-SCC.

1¾ YARD

BUCYRUS-ERIE 43-B GAS CLAMSHELL AND CHAIN CROWD SHOVEL. 22' Boom, 16' Dipper Handle, 1¾ yard Dipper. 50' Clamshell Boom. No Bucket. Electric Starter. Single Shaft Cat. Wisconsin E-6-cylinder 6"x7" Engine. Excellent condition. Located New York.
Box 925-SCC.

LARGE SHOVELS AND DRAGLINES
2 Yards and Over

1½-W MONIGHAN WALKER. Diesel power. 2 yard capacity. 60-foot boom. Good condition. Reasonably priced. Located Kansas.
Box 742-LSD.

BUCYRUS-ERIE 50-B STEAM COMBINATION SHOVEL-DRAGLINE. 26' boom, 17' dipper handle, 2 cubic yard dipper. 60' boom dragline equipment including 2 cubic yard Page Class M bucket and steam operated lighting plant. Machine can be placed in operation quickly with installation few small parts. Very attractive price. Located Alabama. Box 842-LSD.

2-W MONIGHAN WALKER, 3½ yard capacity. 70-foot boom. Good condition. Reasonably priced. Located Kansas. Box 743-LSD.

CLASS 230 STEAM DRAGLINE. 175-foot steel and aluminum boom. 6-yard RED ARCH bucket. Ready to work. Located near New Roads, Louisiana. Box 751-LSD.

TYPE 175-B ELECTRIC, No. 794 equipped with 87' shovel boom, 48' dipper handle, 3½-yd. bucket, and dragline equipment including 125' boom, and 3½-yd. bucket. This machine was recently reconditioned and is in good operating condition. Present location, Connecticut. Box 263-LSD.

BUCYRUS-ERIE 50-B, 1¾ yard steam shovel, steel cab, may be inspected. Located Minnesota. Box 827-LSD.

FOR SALE OR RENT

320-B BUCYRUS STEAM DRAGLINE, truck mounted, 165' boom. 6 and 8 cu. yd. Bucyrus-Erie dragline buckets. Also shovel attachment consisting of 100' boom, 52' dipper handles, two 8 cu. yd. dippers (one new). Machine located on Canadian side Detroit River near Detroit; shovel attachment located in Vermont. Both duty paid into Canada. Can work or be shipped anywhere in U. S. or Canada. $10,000 worth spare parts available. Priced right. Box 926-LSD.

PRICE VERY ATTRACTIVE

BUCYRUS-ERIE 50-B STEAM COMBINATION SHOVEL AND DRAGLINE, shop number 10557. 26' boom, 17' dipper handle, 2 yd. dipper. 50' boom dragline equipment, 1¾ yd. Page bucket. 1 KW 32 volt Moon electric light plant. 54"x9'7" standard coal burning locomotive-type boiler. Also 2 steel under-frame flat cars on which machine is now loaded. New 1929. Moved only 250,000 yards of material. Excellent condition. Price very attractive. Located Kansas City, Mo. Deal direct with owner. Box 900-LSD

100-B STEAM SHOVEL, 3 yd. dipper, located Eastern Canada. Immediately available. Used—good condition.
Box 669-LSD.

100-C BUCYRUS STEAM SHOVEL on trucks. 3½-yard dipper. New 1914. Willing to sell very cheap. Located near Allentown, Pa.
Box 807-LSD.

50-B STEAM SHOVEL, Number 3946; equipped with 1½-cubic-yard dipper, 26-foot boom, also 1½-cubic-yard dragline bucket with 50-foot boom caterpillar mounted, equipped for burning oil, located at Texarkana, Ark. Price $3,000. Box 112-LSD.

PAGE DRAGLINE, track mounted, 90-foot boom, 3½-yard Page RC bucket with new 150 h.p. Venn-Severin Diesel engine. Thoroughly overhauled and rebuilt in 1935. Now working in Indiana. Box 768-LSD.

FOR SALE OR RENT

TWO CLASS 14 STEAM DRAGLINES, 70-foot booms and 2-yd. buckets. Caterpillar mounted. Equipped for burning gas or oil. Located in southwest. Price at approximately $4,000 each. Box 821-LSD.

CLASS 320 STEAM DRAGLINE. 144-foot boom. 8-yard bucket. Located on Illinois River. A good buy. Box 750-LSD.

CLASS 14 DIESEL-ELECTRIC DRAGLINE, 70-foot boom. 2-yard bucket. Immediately available. Located near St. Louis. Box 749-LSD.

70-C BUCYRUS STEAM SHOVEL on Cats. Complete. In operating condition. Shop number 1712. Also one extra three-yard Manganese dipper and sticks. Chicago territory.
Box 847-LSD.

MARION 480 2-YARD STEAM SHOVEL, good working condition. Substantial saving. Located in Minnesota. Box 826-LSD.

BUCYRUS-MONIGHAN 3-W walking dragline. 85' boom, 2½-yard bucket. Located Stovall, Miss. Box 843-LSD.

BUCYRUS-ERIE, 70-C, 2½-yard steam shovel, railroad type. Located in Minnesota.
Box 829-LSD.

P&H MODEL 900, 3½ yard Diesel Shovel. 33-foot boom, 200 h.p. Fairbanks-Morse engine. Mounted on caterpillars. Box 828-LSD.

CLASS 14 DIESEL ELECTRIC DRAGLINE for sale. 70' boom. Can be seen working during next 30 days. Good price. Southern location. Box 846-LSD.

FOR SALE

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

BUCYRUS-MONIGHAN 4-W Walking dragline, 80' boom 5½-yard Page bucket, 30' boom insert and 4-yard bucket. Located Tennessee. Box 844-LSD.

FOR SALE OR RENT

CLASS 24 BUCYRUS STEAM DRAGLINE. 125' boom. Skid and roller mounted. Spare parts. Located on Detroit River near Detroit. On Canadian side, duty paid into Canada, but can work or be shipped anywhere in U. S. or Canada. Priced to sell. Box 927-LSD.

ANY FAIR OFFER ACCEPTED

Class 24 steam dragline. 100 foot boom, 5 cubic yard bucket. Skid and roller mounted. Rebuilt 1927 at a cost of $15,000. New locomotive boiler installed 1928. Will accept any fair offer. Located near Fort Worth, Texas. Box 823-LSD.

3—MARION 92-M, 4-YARD RAILROAD TYPE steam shovels located near Hibbing, Minnesota. Box 830-LSD.

BUCYRUS-ERIE 50-B Steam shovel, located Montana. Attractive price. Box 845-LSD.

68-C BUCYRUS ELECTRICALLY OPERATED SHOVEL, equipped with 2½-yard manganese front dipper, 3 phase, 60-cycle, 440-volt motors, transformers, cable, reel and approximately 1400 feet of cable all in excellent condition. Reasonable price. Address Box 268-LSD.

MONIGHAN DRAGLINE MODEL T, 2-cubic-yard 60-foot boom located near Wichita, Kansas. About seven years old. Has recently been thoroughly overhauled. Box 180-LSD.

MONIGHAN STEAM DRAGLINE, two cubic yards capacity. 60' boom. Horizontal locomotive-type boiler. 2½-yard Page bucket. In good operating condition; overhauled in 1931 and not used. Located Iowa. Box 770-LSD.

CLASS 14 STEAM DRAGLINE, 60' boom. 2 cubic yard Page bucket. Locomotive-type boiler. Thoroughly overhauled and ready for service. Located Iowa. Box 771-LSD.

TWO 3-W MONIGHAN WALKERS. 3½ yards. 70- and 77-foot booms. Good condition. Reasonably priced. Located Louisiana. Box 745-LSD.

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LOCOMOTIVES

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1 Crowding Engine
1 Five Yard Dipper

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Excavating Engineer
South Milwaukee, Wisconsin

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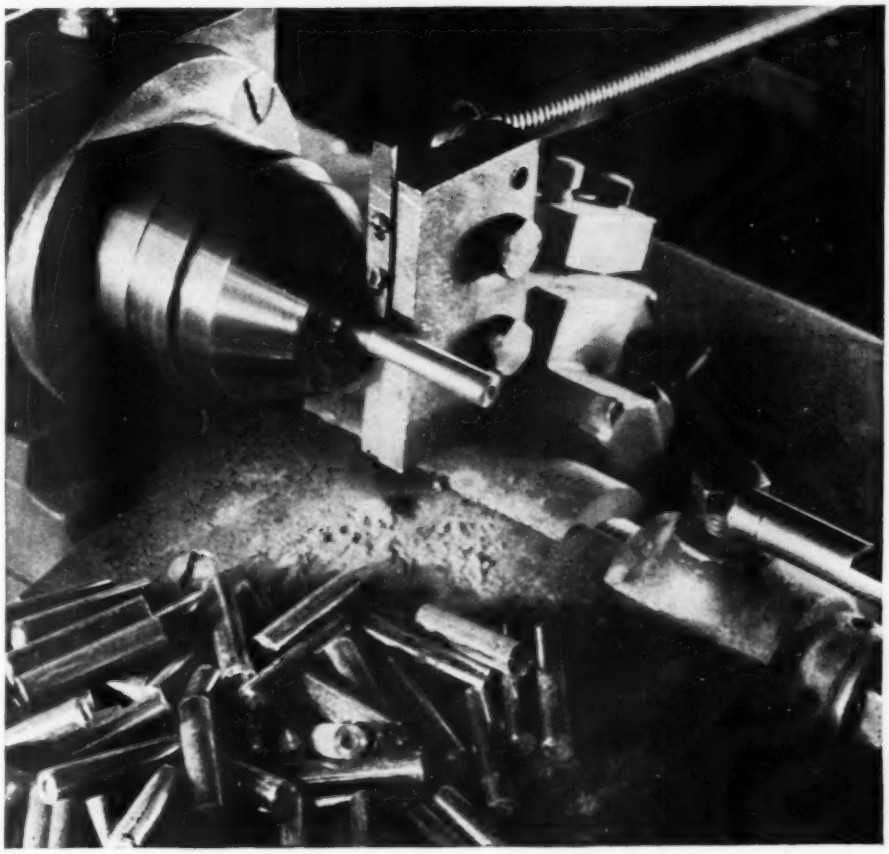

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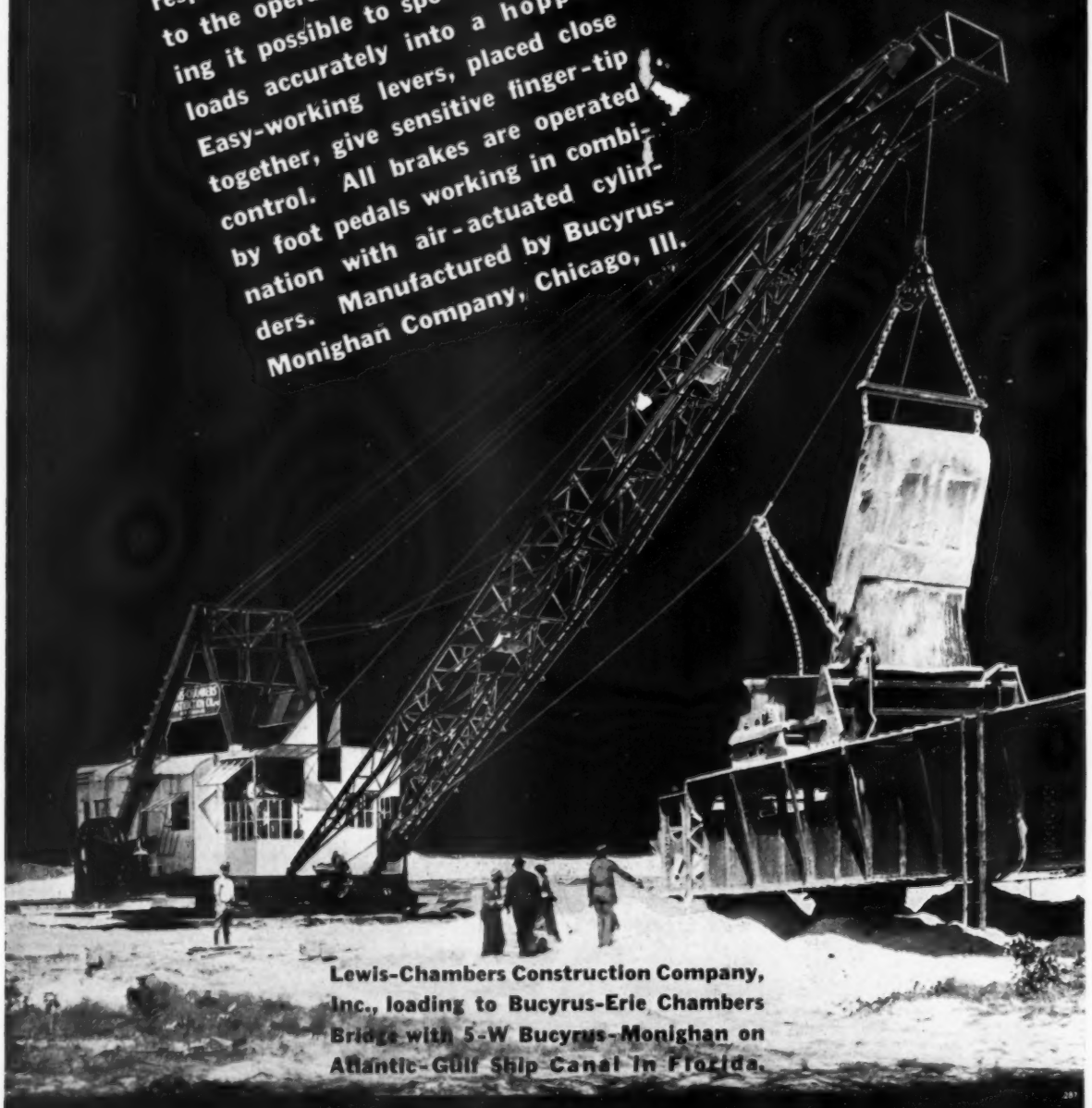

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